# WIRE AND WIRE PRODUCTS

MARCH 1942

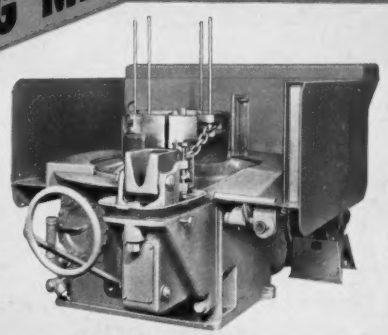

THE SINEWS OF WAR

WIRE, as the basis of thousands of essential products in America's war economy, provides the very sinews of war for our armed forces — for civilian defense — for the industrial and agricultural fronts in our battle for victory.

In all of its forms, wire must be produced in hitherto-unrealized quantities — to the highest standards of quality for the toughest kind of service. Vaughn Wire Drawing Machinery is standing up 100% to the job, in the hands of an industry able and determined to lick the greatest production problems in our history.

THE VAUGHN MACHINERY COMPANY
CUYAHOGA FALLS, OHIO, U. S. A.

VAUGHN
WIRE DRAWING MACHINERY



The MOTOBLOC—for fast handling of bullet stock and other special alloys and steels for war needs.


OFFICIAL PUBLICATION OF THE WIRE ASSOCIATION

# A Big Hand in Victory

MANY LEADING PLANTS ON WAR PRODUCTION ARE USERS OF CARL-MAYER FURNACES AND OVENS — FOR CARL-MAYER EQUIPMENT HAS PROVED ITS METTLE IN MEETING ANY EMERGENCY WITH FOREMOST SPEED AND DEPENDABILITY.

*A few Carl-Mayer Customers*

*Allegheny Ludlum Steel Co.*
*Aluminum Co. of America*
*Atlantic Wire Co.*
*Atlas Steel Co.*
*American Magnesium Corp.*
*Bridgeport Brass Co.*
*Eclipse Aviation Division of Bendix Aviation Corp.*
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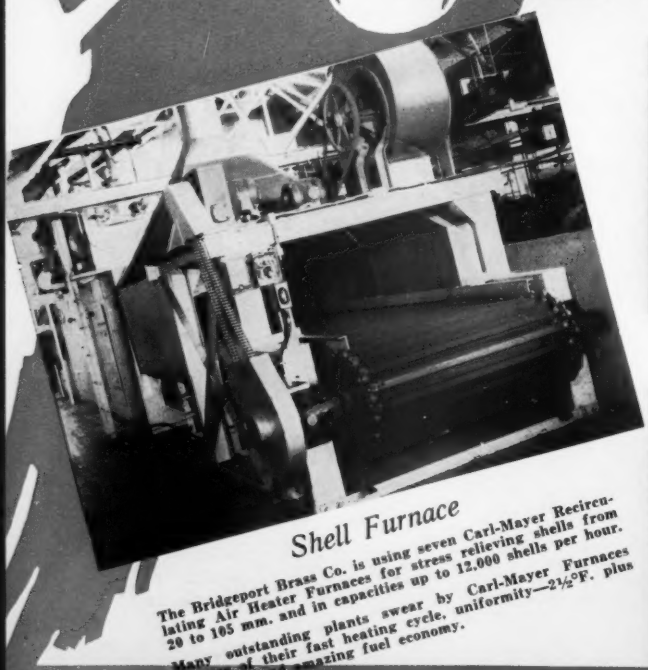
*Over 20 Years' Experience in Speeding up Production*

# CARL-MAYER

## FURNACES, ROD BAKERS, WELDING ROD OVENS



*Shell Furnace*

**The Bridgeport Brass Co. is using seven Carl-Mayer Recirculating Air Heater Furnaces for stress relieving shells from 20 to 105 mm. and in capacities up to 12,000 shells per hour. Many outstanding plants swear by Carl-Mayer Furnaces because of their fast heating cycle, uniformity—2½°F. plus or minus, and amazing fuel economy.**

*HI-SPEED Rod Baker*

**No other rod baker approaches its speed and economy —SAVES UP TO 50% IN TIME AND FUEL. Blow-off feature removes moisture without bumping or agitating the coils. Ask where to see it in operation. PATENT NUMBERS — U.S.A., 2235559 — CANADA, 396144 and 401589.**
**Other Patent Claims Allowed and Pending**

•

*Welding Rod Oven*

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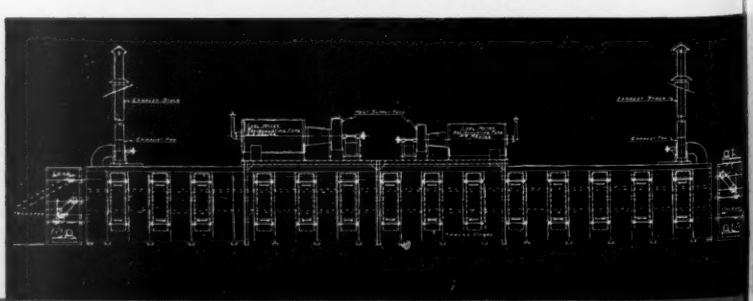
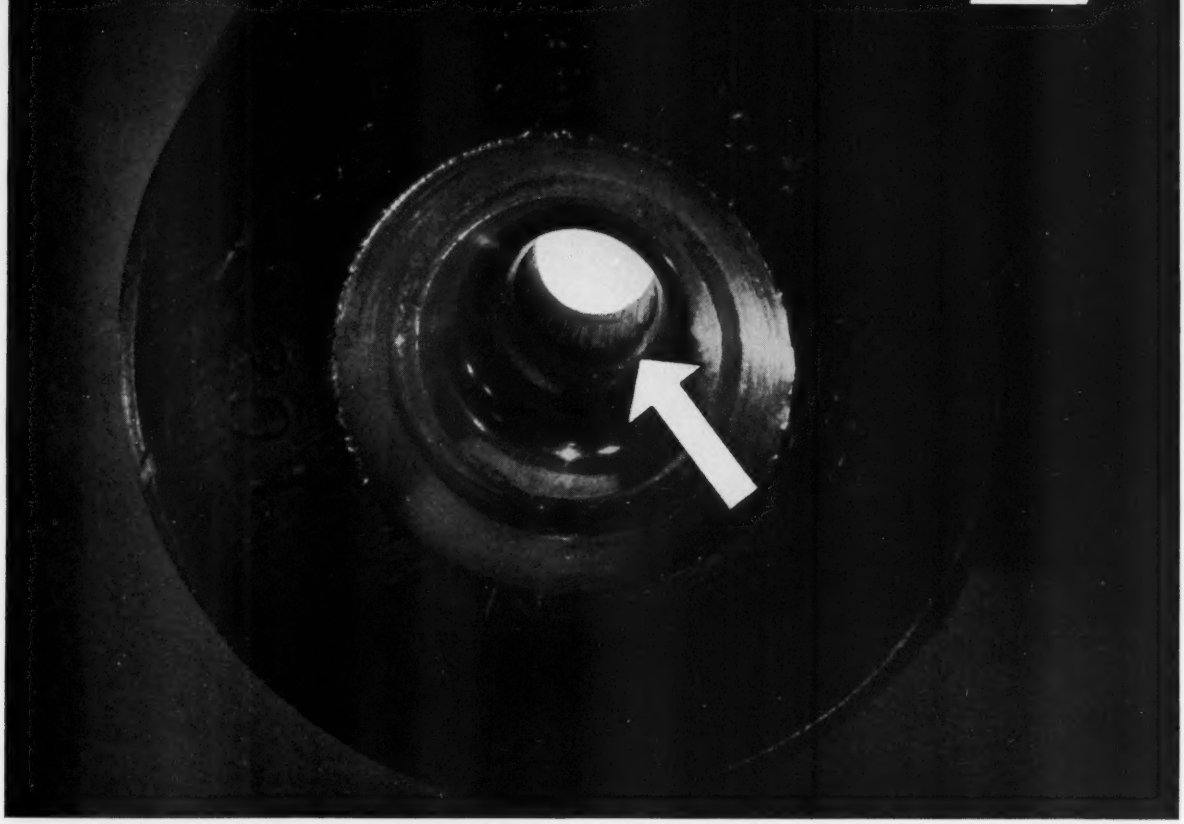


THE CARL-MAYER CORPORATION

# Are Your Carbide Dies Sent Back To Your Die Room - - - Like This?



IT'S EASY to "spot" a carbide die that has been left on the job too long to recondition without loss of hole size. You'll find, first, a deep internal ring worn at the point where the wire first contacts the die nib. Immediately below this ring, you'll notice heavy grooves running from the ring to the end of the bearing. Both the ring and the grooves are visible to the naked eye, as the above photo of a die taken from actual service, indicates.

When these signs of advanced wear appear, it is too late to recondition the die by simple repolishing. Instead, a recut to next size, with loss of normal tonnage through the die, becomes necessary.

A definite procedure for eliminating the causes responsible for this condition, are among the many services Carboloy Die Servicemen will be glad to provide without obligation. These services include everything from the polishing of a die to the complete layout of a carbide Die Room.

**CARBOLOY COMPANY, INC., DETROIT, MICH.**

CHICAGO • CLEVELAND • LOS ANGELES • NEWARK • PHILADELPHIA • PITTSBURGH • SEATTLE • WORCESTER, MASS.

Authorized Distributors: Canadian General Electric Co., Ltd., Toronto, Canada • Hartley Wire Die Company, Thomaston, Conn.

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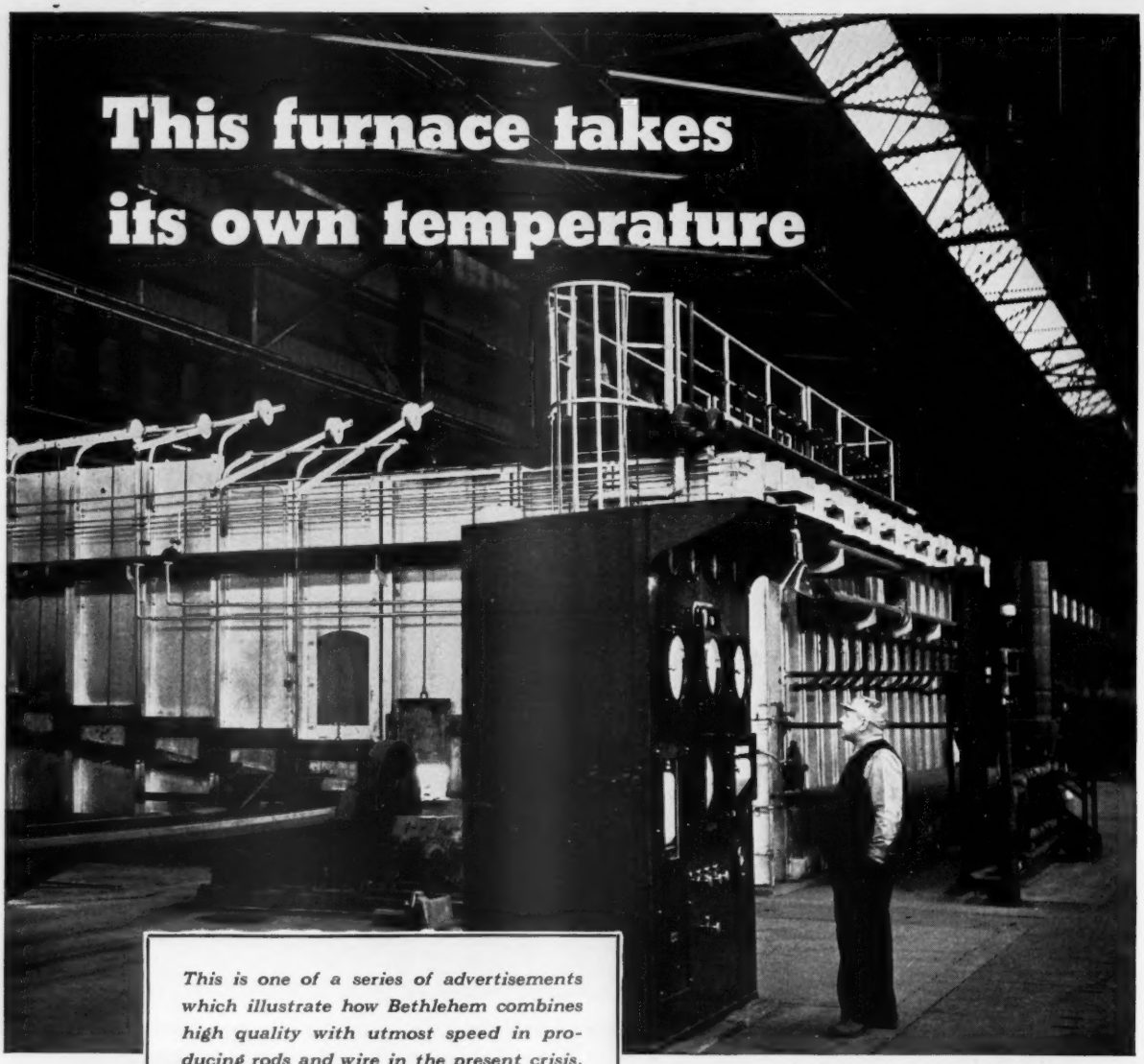
TOOLS - DIES - DRESSERS
CORE BITS - MASONRY DRILLS
- WEAR RESISTANT PARTS -

FOR THE MANUFACTURING · MINING · TRANSPORTATION · CONSTRUCTION INDUSTRIES



# This furnace takes its own temperature

*This is one of a series of advertisements which illustrate how Bethlehem combines high quality with utmost speed in producing rods and wire in the present crisis.*

## BETHLEHEM WIRE

**50** tons of steel billets move across the hearth of this preheating furnace, their color turning slowly from cherry red to orange to bright yellow. At the proper moment, the furnace door opens, a hot billet emerges, and is snapped up by the whirling rolls of the rod mill . . . then another . . . and another . . . reaching a speed of 3800 per minute as they leave the finishing rolls.

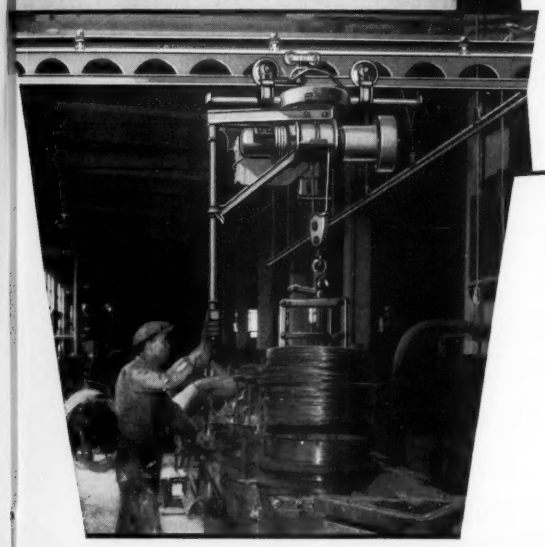
Each billet is precisely as hot as its neighbor. Each billet is soaked to the same uniform temperature from end to end. As a result, each billet responds uniformly to reduction in the rod mill. The mile-long coils of rods which grow out of the chunky 30-foot billets are virtually identical. These rods make top-quality wire.

Hand-operation is not relied on to control the billet preheating furnace. Thermocouples, set inside the furnace, generate small but extremely accurate currents of electricity (in direct proportion to the heat in the furnace). These small currents regulate and record fuel consumption, pressures and temperatures inside the furnace. The entire heating operation is fully automatic.

BETHLEHEM STEEL

## BETHLEHEM STEEL COMPANY

# BLOCK STRIPPING CRANES and CARRIERS SPEED PRODUCTION



## FOR INTERNAL OR EXTERNAL BLOCK STRIPPING

Cleveland Tramrail block stripping cranes and carriers make possible the drawing of heavier bundles and permits a man to take care of more blocks. With this equipment older experienced men can usually keep pace with younger men. Hernia injuries from heavy lifting are eliminated.

The cranes or carriers are easily propelled by hand by means of a rigid arm. At the lower end of the arm is a push button station for convenient operation of the electric hoist. If desired, the hoist may be mounted on a turn-table for ready service to blocks on two sides of an aisle.

Cleveland Tramrail equipment is available for internal stripping, as well as for external stripping of old style non-slotted blocks.

Equipment for block stripping is only one of many items Cleveland Tramrail has developed for the Wire and Wire Products Industry.

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*GET THIS BOOK!*

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THE CLEVELAND CRANE & ENGINEERING CO.
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# CLEVELAND TRAMRAIL

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# READ the Advertising in

## WIRE
### AND WIRE PRODUCTS

It contains important information for you. Without this advertising we could not give you the editorial service you secure from the pages of WIRE & WIRE PRODUCTS nor run the Wire Association, which is a non-profit organization, run without compensation to officers and executives.

+ + +

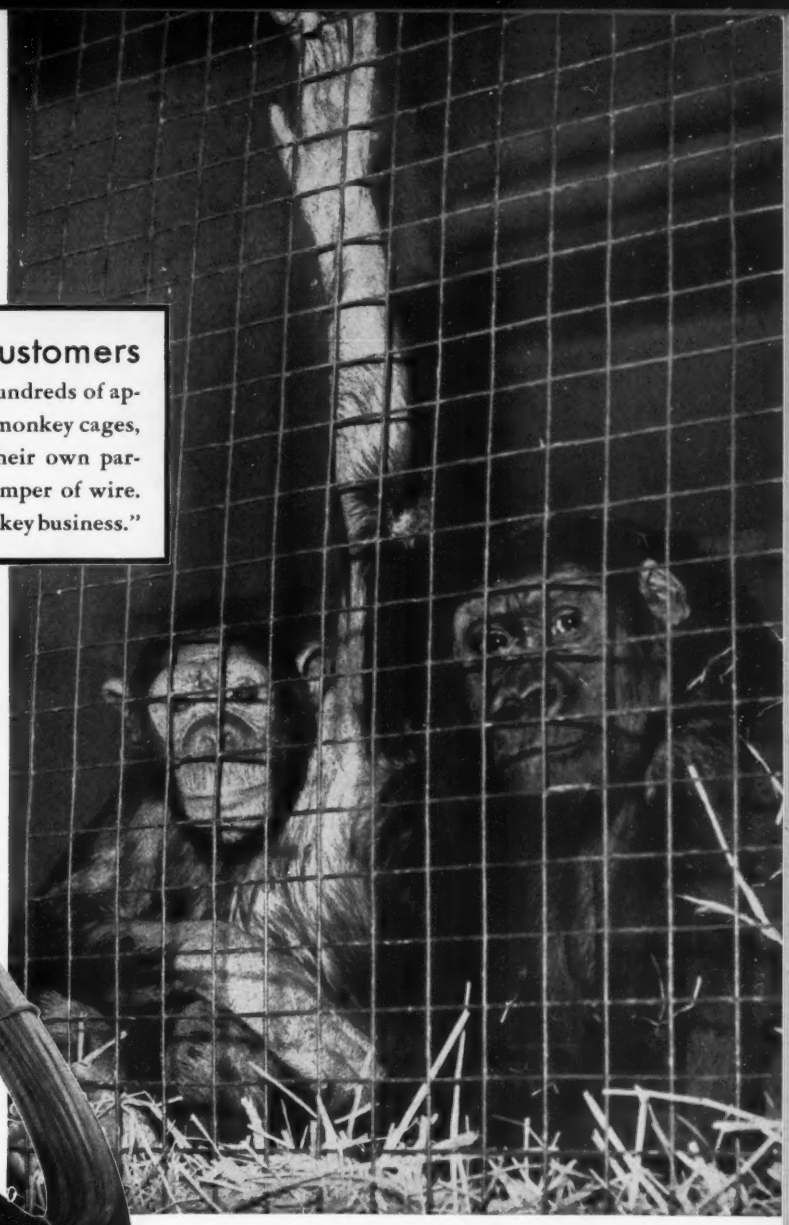
**And when you write to, 'phone or see an advertiser, PLEASE MENTION WIRE & WIRE PRODUCTS.**

+ + +

It is only in this manner can he tell that his advertising is being seen, read and acted upon. We will appreciate your cooperation in this regard, and it will help us to serve you, our readers.

+ + +

**WIRE AND WIRE PRODUCTS**



## Monkeys Are the Craziest Customers

Monkey cages are just one more example of the hundreds of applications of Continental SUPERIOR wire. Like monkey cages, most all these hundreds of applications have their own particular requirements in size, shape, coating and temper of wire. Filling all these requirements is anything but "monkey business."

# WIRE FOR A THOUSAND USES

In monkey cages and army tanks... in simple applications and in jobs that call for some unusual shape or fabricating quality, you find Continental SUPERIOR wire.

Produced in sizes from 34 gauge to 5/8 inch . . . in standard and special shapes... and in a wide range of finishes, Continental offers thousands of different combinations of specifications in wire. Continental makes it their business to provide the exact type of wire to make a better product and assure smoother, faster production. Their experience as manufacturer of "*Wire for a Thousand Uses*" can be helpful to you.

**CONTINENTAL STEEL CORPORATION, Kokomo, Indiana**

(The Superior Sheet Steel Company, Canton, Ohio—a subsidiary)

# CONTINENTAL
## STEEL CORPORATION

**SHEETS:** Black, Galvanized, Copperior, Hot and Cold Rolled, Special Coated, Long Terne, etc.

**WIRE:** Bright Basic, Annealed, KONIK, Copperod, Tinned, Special Manufacturer's, etc.

Long runs to close tolerances with smooth finish free of scar marks is the high performance users get from Vascoloy-Ramet Tantalum-Tungsten Carbide Dies.

In addition to correct design and first quality materials, Vascoloy-Ramet workmanship plays no small part in assuring this high performance.

Workmanship in blending the various carbide powders and processing them assures a homogeneous hard mass. Our processes have demonstrated their advantages particularly in large dies and in shape dies where, in the rough cored condition, close tolerances are maintained. This cuts finishing time to a minimum.

Workmanship and care in casing the die itself and right through to the final polishing operation — the result of much experience by some of the best carbide die men — insures in a Vascoloy-Ramet die the ultimate in high performance in a carbide die.

Whether it is a few cold nosing dies for shells requiring pounds of tantalum-tungsten carbide, or small wire-drawing dies by the thousand, Vascoloy-Ramet experience, laboratory control, and painstaking workmanship insures a uniformity in this high performance.

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4219

**THE SUPERIOR TANTALUM-TUNGSTEN CARBIDE DIES**

*If it's a question of a protective coating for iron or steel*

# JETAL *is the answer!*

**Has Defense made certain metals unavailable to you?**
JETAL can be substituted for nickel, zinc, cadmium and tin plating.

**Do you need to increase production of blackened ferrous parts?**
JETAL assures 100% increase in production. Requires no skill, no elaborate equipment, no electrical current.

**Do you want to increase the wear resistance of blackened parts?**
JETAL gives from 50% to 70% more abrasion and wear resistance—as high as 230% by changes in procedure.

**Do you seek a rust-resistant finish?**
JETAL, with proper protective oils or lacquers, offers high salt spray resistance.

**Do you want to save on finishing costs?**
JETAL saves you 30% in price . . . and goes farther.

**Do you want an ideal base for lacquers, enamels and japan?**
JETAL, as a base, shows superior salt spray resistance, improved bonding and prevents spreading of corrosion under the film.

*Ideal for Wire and Wire Products*

**JETAL—the original, patented method of blackening iron and steel, imparts a lustrous, dense black finish by a brief immersion in a moderately heated bath. JETAL hardens the surface, penetrates deeply, enhances appearance—does not alter dimensions or surface textures. Integral with the metal itself, it cannot chip, scale, peel or discolor. JETALized stock can be rolled, bent or stamped without affecting its finish. JETAL is world-known for its simplicity, speed and economy. JETAL is backed by a competent research staff who can help you with your protective coating problems.**

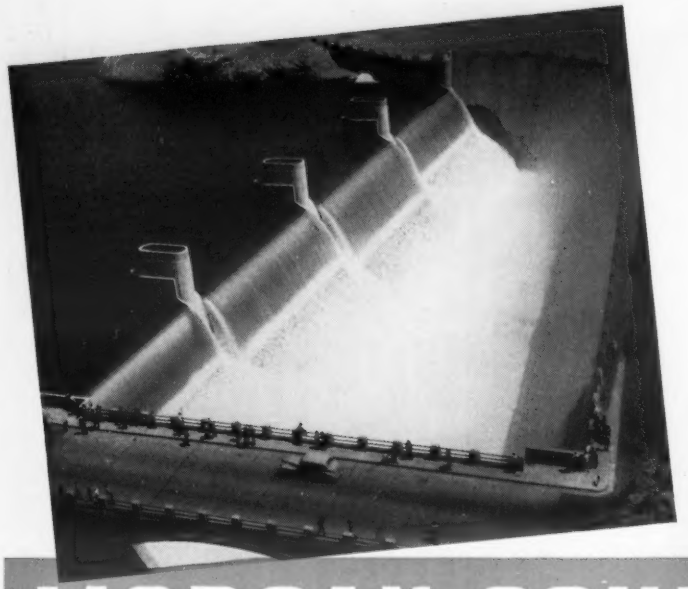
*Immediate delivery -- any quantity.*

**Send samples for JETALizing without charge. Consultation service without obligation.**

## ALROSE CHEMICAL CO.

**Providence, R. I.** **Tel. Williams 3000**

the JETAL process



# The need for MORE POWER

This problem is answered in part by reducing power losses. We could write quite a story about bearings, gears, lubrication—weight and strength of materials—speeds, balance and loads. The fact is that Morgan Wire Machines show a very high power-efficiency rating with a high Production Factor*. We know the power performance of each Morgan Machine before it leaves the plant . . . we specify the motor!

***Production Factor:* Like the Factor of Safety, the production capacity of Morgan Machines has always been well above rated capacity.**

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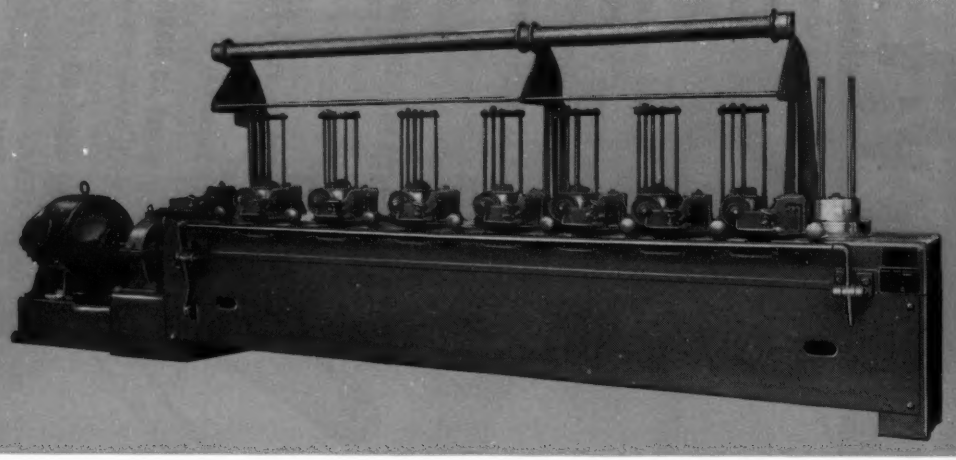
# MORGAN-CONNOR WIRE MACHINES

Morgan-Connor Type D Continuous Wire Drawing Machine for high or low carbon stock, sizes from No. 17 patented wire. High block design provides ample storage of wire between drafts. This storage feature permits proper cooling of the wire, and eliminates slippage. Compact floor space, unit powered—a continuous producer built to take it!



# WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip, Wire and Rod Products and Insulated Wire and Cable

DRAWING—ROLLING—EXTRUDING—FORMING—FABRICATING

Vol. 17 MARCH, 1942 No. 3

Designated as

Official Publication By The Wire Association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LOW WEIGHT AND LONG LIFE ECONOMIES . . . .

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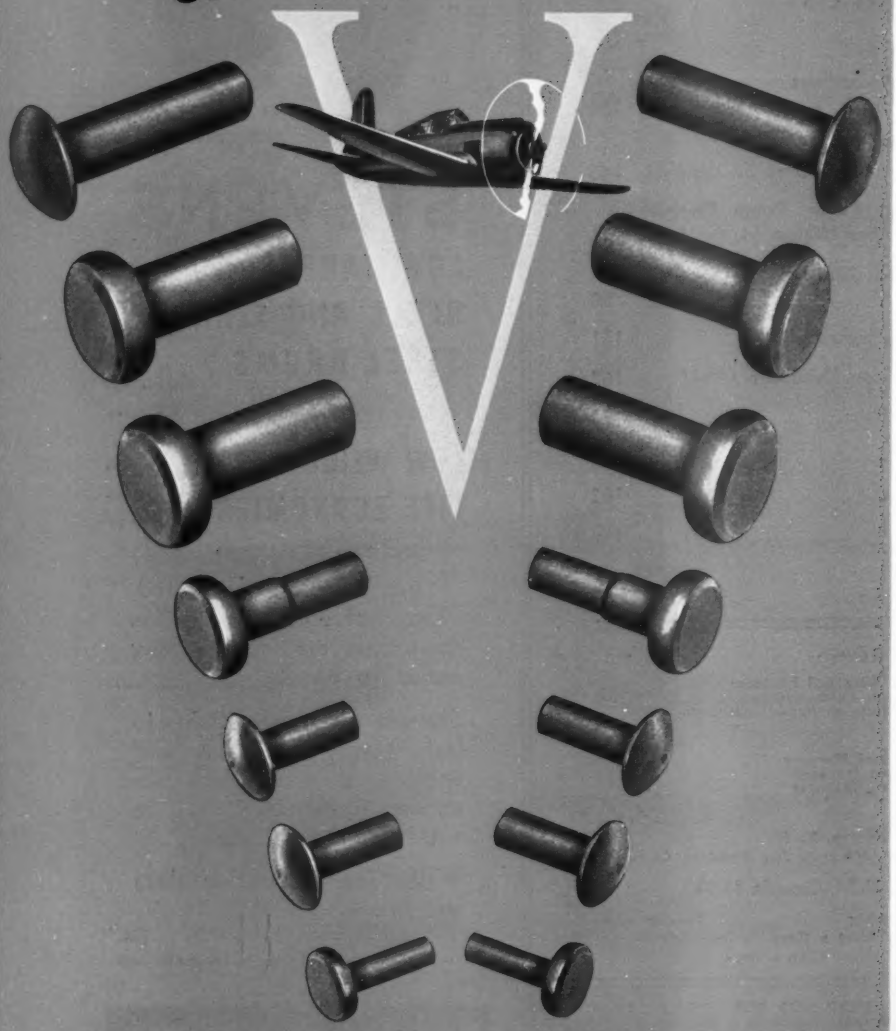

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# WIRE AND WIRE PRODUCTS

A monthly publication devoted to the production of Wire, Rod and Strip.
Wire Products and Insulated Wire and Cable.
DRAWING --- ROLLING --- EXTRUDING --- FORMING --- FABRICATING

Vol. 17 MARCH, 1942 No. 3


# Aeronautical Applications of Instrument Springs


By J. W. Rockefeller, Jr.,
All-Weather Springs, Inc.,
New York, N. Y.



**The effect of temperature on the action of instrument springs demands increasing recognition because of recent developments in high altitude flying. The author gives some interesting information on this subject.** ✦ ✦ ✦ ✦ ✦


AS the ceiling for aircraft has been pushed to higher altitudes, the temperature effect upon materials used in their construction has come into sharper focus. Tests are conducted in temperatures which span 200° on the Fahrenheit thermometer; that is, from —50°F. to +150°F. That which has heretofore been considered a maximum temperature range in many cases has been doubled. Under such wide temperature variations, rubber will change from an elastic material to one which is brittle. Ordinary lubricating oils will cease to flow and even metals will be sufficiently changed in some of their important properties as to require consideration of the thermal effect in the design of instruments.

✦ ✦ ✦

THE effect of temperature upon the stiffness properties of metals, particularly springs, has been given attention by instrument engineers for over 50 years. Temperature changes in ordinary springs will tend to produce errors of zero and errors of scale. Zero errors; that is, the failure of the instrument to register correctly at zero load under varying temperatures, are usually due to expansion of parts. Expansion of parts may also, however, contribute to scale error; that is, an error in scale indication between zero and any given load. For example, if certain moving parts in the instrument expand unequally, a scale error will be introduced. Cams, tapes, racks and pinions in instruments may all be so affected by thermal expansion as to produce scale errors as well as zero errors.

J. W. ROCKEFELLER, JR.

Graduated from Massachusetts Institute of Technology 1921. 1921-1928, John Chatillon and Sons, New York, N. Y., from which resigned as Works Manager to enter consulting field. Has been engaged in installation of spring plants and design and production of wire springs for firms in spring, spring balance, and automotive fields. Charts for calculation of helical springs, translated into Kilo-Cm basis and adopted by Italian Engineering Standards Committee, 1926. Secretary of Spring Research Committee of American Society of Mechanical Engineers for five years and during that time representative of American Society for Steel Treating on that committee.

✦ ✦ ✦

THE effect of temperature upon the stiffness of the elastic elements of the instrument is usually responsible for the greater part of scale error. Such elastic elements will include metallic bellows, bourdon tubes, and springs. A brief consideration of the factors which affect the accuracy of instruments over wide temperature ranges will suffice to convince that to obtain a high degree of accuracy, any thermally com-


**Designated as Official Publication by the Wire Association**

pensating spring must be manufactured for the particular needs of the individual instrument. In the case of weighing scales, for example, the expansion of the rack which actuates the pinion may produce a plus error of approximately 10 x $10^{-6}$ per 1°F. If the main springs of this scale then are made exactly self-compensating; that is, if the thermal modulus coefficient of the spring is zero, the scale will have a plus error equal to the error due to the expansion of the rack. In order to obtain complete compensation in the scale itself, it is necessary to give the spring a temperature modulus coefficient of —10 x $10^{-6}$ completely offsetting the error in the rack and pinion.

✦ ✦ ✦

IN the design of instruments, there is frequently an elastic element which operates in connection with the main spring, such as a bourdon tube or bellows. In either case, the rate of stiffness of this element is affected by temperature changes. For all ordinary elements of this type, the thermal coefficient of modulus is negative in sign; that is to say, as the temperature decreases, the element becomes stiffer. When a spring is used in connection with such an elastic element, it is necessary to give the spring a plus coefficient of modulus to offset this negative coefficient of the bourdon tube or bellows.

✦ ✦ ✦

THE bimetallic self-compensating spring, (United States Patent No. 2,236,158) has been developed to meet the demands for a force indicator in which a high degree of accuracy is maintained under wide temperature variations. This spring is usually made in two sections in the form of a helical extension spring as shown in Figures 1 and 2 or as a compression spring shown in Figure 3. One section is coiled of a ferrous nickel alloy ordinarily one having a nickel content of about 36% although theoretically any nickel content between 27% and 45% may be used. The other section of the spring is coiled of beryllium copper, steel or any desirable spring material depending upon the properties sought in the combination. The nickel alloy can usually be so reproduced as to give consistant temperature modulus coefficients and will be uniform in other respects. It is more resistant to corrosion than steel and has other spring properties aside from the thermal one which are of advantage in instrument spring manufacture. The ratio of deflection between the two sections under a given load is pre-determined and so worked out that the temperature coefficient of elastic modulus of the combination will be such as to offset the algebraic total of all other temperature errors in the instrument. It's percent change in stiffness is +6.4% for a 200° F. temperature change. Since at a 36% nickel content, the plus thermal characteristic of nickel ferrous alloys reach a maximum it is at this point that a minimum of this alloy will be used in combination with any material which forms the other spring section. For example, in combining with high carbon steel having a minus stiffness change of 2.8% per 200°F. temperature change, the ratio of deflection between the two sections will be $\frac{6.4}{2.8}$ or approximately 2.3 to 1. When combined with beryllium copper, the ratio will be $\frac{6.4}{3.8}$ or a ratio of approximately 1.7 to 1.

**TABLE 1**
**Percent Change in Stiffness for 200°F. Change in Temperature**

| Spring Material | % Change in Stiffness |
|---|---|
| High carbon steel | 2.8 |
| Piano wire | 3.0 |
| 5% Nickel steel | 3.2 |
| Chrome-vanadium steel | 3.0 |
| 18-8 Stainless steel | 5.0 |
| Monel metal | 3.2 |
| Nickel silver | 3.8 |
| Beryllium copper | 3.8 |
| Phosphor Bronze | 4.2 |
| Brass | 4.4 |
| Elinvar | .8 |

Table 1. Stiffness change in various spring materials with a 200°F. temperature change. ✦

✦ ✦ ✦

THUS when steel is used in combination with the 36% nickel alloy, over 73% of the deflection will take place in the steel section and less than 27% in the 36% nickel section. It will be readily seen that the principle embodied in this spring permits:

1. **The close control of thermal elastic properties regardless of any thermal**

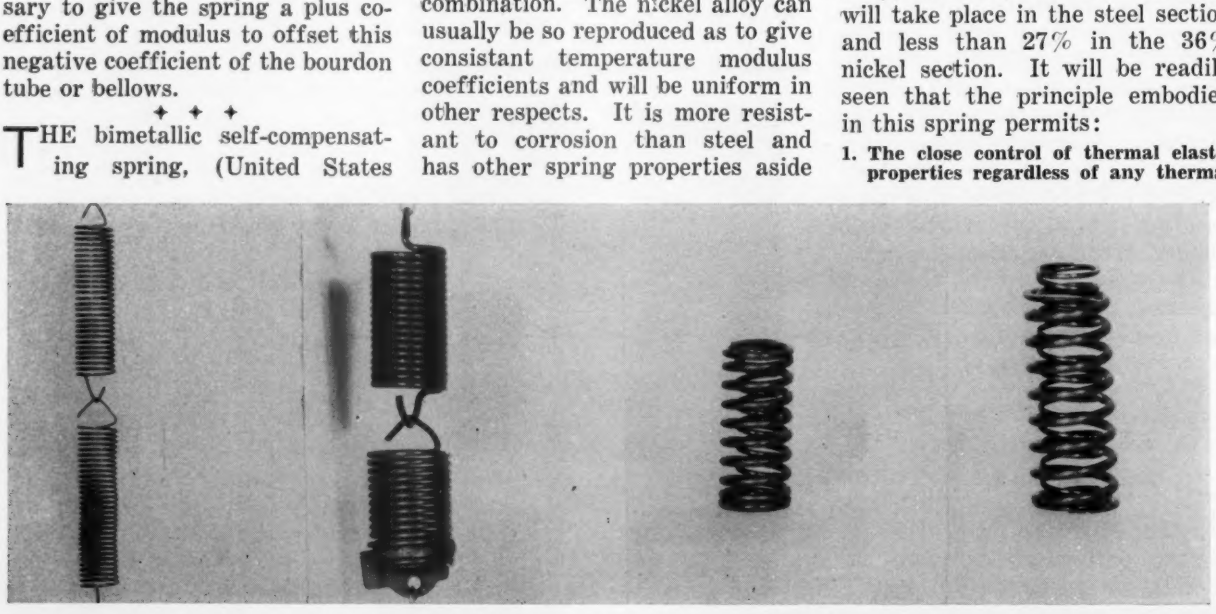


Figure 1. Self-compensating nautical instrument spring. Maximum capacity 8 ounces.

Figure 2. 30 lb. self-compensating scale spring equipped with calibrator. ✦ ✦ ✦

Figures 3 and 4. Concentric thermally compensated compression springs. ✦ ✦ ✦

**elastic changes which may have taken place in the material due to minute variations in chemical composition, cold working, heat treatment, etc.**

**2. The accurate production of any temperature modulus coefficient desired in the combination between +6.4% and —5% per 200°F. temperature change. Both of these are obtainable through the ratio change in deflection between the two sections.**

✦ ✦ ✦

UNTIL recently the chief application of this spring was in spring scale construction. In a 30 lb. scale, the bimetallic self-compensating spring permits consistant accuracy of .2 oz. under a total load of 50 lbs. within a temperature range of 100°F. or an accuracy of one part in 3500 over this temperature range, an improvement of over 400% as compared with that usually obtainable by ordinary thermostatic devices. For such work, extension springs are made of one section containing approximately 36% nickel another made of either steel or beryllium copper. In instrument work, in addition to extension springs, thermally self-compensating springs are made of the concentric helical compression type, the sections being used in parallel. For the section having a plus characteristic, a 36% nickel iron alloy is usually selected. The other section is made of steel, beryllium copper or other materials depending upon the other properties sought in addition to thermal accuracy. Where electrical conductivity and good creep properties are desired, for example, beryllium copper is ordinarily selected. Where space limitations require a higher strength, steel music wire may be used.

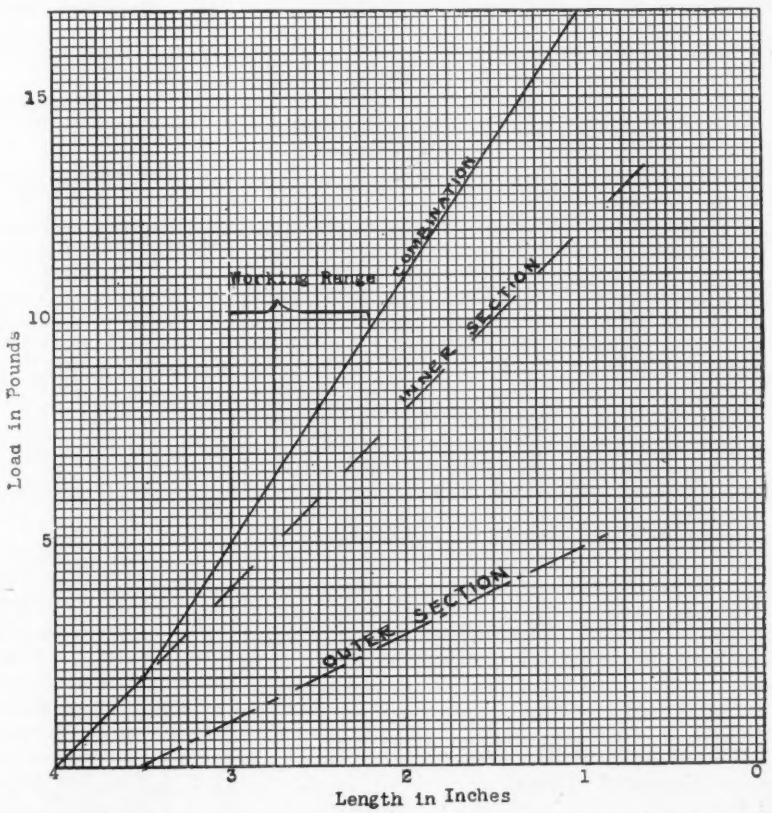



**Figure 5. Load deflection diagram of compression spring shown in Figure 4. Although the two sections have different free lengths, it will be seen that over the working range of the combination the characteristic is practically linear.**

✦ ✦ ✦ ✦ ✦ ✦

IT frequently happens that instrument springs, once the instrument is assembled are never released to a point where they assume their unrestricted proportions. This is true in the case of springs for barometers where the changes in atmospheric pressure are relatively small in comparison with the absolute atmospheric pressure. In designing springs for inclusion in such instruments, it is not necessary to make the inner and outer sections the same length and frequently different lengths are used to obtain other desirable properties such as the elimination of zero error. Such a spring is shown in Figure 4 and the load deflection chart of this spring in Figure 5.

✦ ✦ ✦

## Bourdon Tube Instruments

THE application in the case of bourdon tubes and instruments based upon this general principle consists usually of introducing merely enough of the 36% nickel alloy spring to offset the temperature elastic changes in the bourdon tube itself. This is accomplished by attaching an extension spring to the free end of the bourdon tube to resist its motion. This combination posseses greater stiffness than the bourdon tube itself and it is therefore necessary to use a more flexible bourdon tube than would be used for the same length reading scale with the bourdon tube alone. In such a combination a temperature error encountered in the standard type bourdon tube has been reduced from 18½ lbs. at 500 lbs. pressure to less than 2 lbs.

✦ ✦ ✦

## Bellows Application

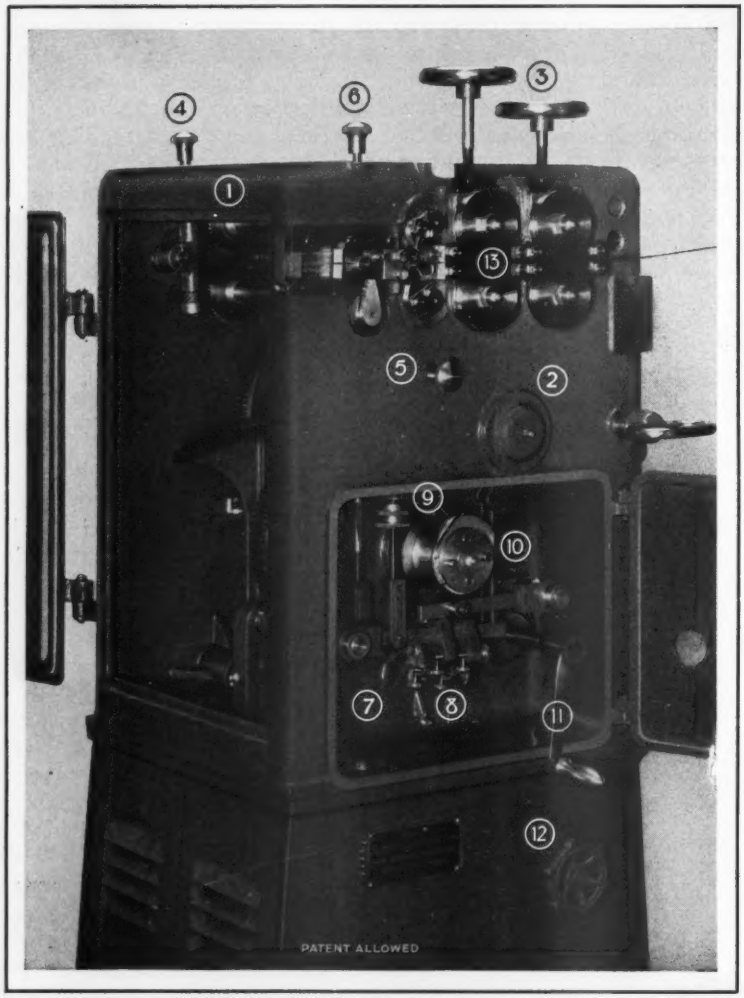
IN making use of the compensated spring in connection with bellows, it is usually desirable for the spring to serve not only as a temperature corrective factor but also to take as great a part of the total load as possible. While in early experiments with self-compensating springs it was not possible to obtain good creep and drift characteristics, it is possible with the present day compensating springs to obtain creep characteristics decidedly better than those found in steel springs. The creep characteristics of the combination of 36% nickel and beryllium copper are considerably better than most bellows materials and by placing the greater

(*Please turn to Page 166*)

# *13 Points of Superiority*

## *in*

## *No. 1 Universal Spring Coiler*




**1-** One piece cast iron housing for rigidity and perfect alignment.

**2-** Ball Bearing construction throughout on all rotating shafts.

**3-** **Convenient Controls—** Individual pressure control for each pair feed rolls.

**4-** Individual simple adjustment for cutter alignment, easily adjusted from upper to lower cutter.

**5-** Pitch and

**6-** Diameter control readily accessible.

**7-** Pitch and Diameter Cam control located in recess in front housing.

**8-** Rapid and micrometer adjustment of compound blocks facilitates set-up time.

**9-** Pitch stop conveniently located and quickly adjusted.

**10-** Combination cam hub for pitch and diameter cams, completely removable from machine.

Both pitch and diameter cams may be shaped and timed on the cam hub for special springs and the entire unit removed from the machine, thus reducing set-up time. Additional cams and hubs can be applied for this purpose.

One piece solid cams can be used on this removable cam hub.

**11-** Removable ratchet-type crank for set-up purposes only. Removed during operation.

**12-** Motor or Pulley Drive as required with variable Speed Transmission for production range if desired.

**13-** Tooling interchangeable with previous Sleeper & Hartley models.

***No. 1 Universal Spring Coiler***

*Segment Type*

*48" Model* *Series 666*

*Wire Range .018" to .080"*

**INCREASED CAPACITY**

Compound gearing for 96" feed if desired.

**Other Improved Features—**

Morse Free Wheeling Clutch for high-speed accuracy. Morse Free Wheeling Recoil Clutch, as extra equipment, if desired.

Single cutter operation.

Wear free diameter slide connection.

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# Theory and Practice of Modern Taping And Stranding

By Otto F. Jagielski
Consulting Engineer
Worcester, Mass.

## PART II—STRANDING

**This is a continuation of the paper presented in the March-April and July issues of 1940 to those interested in wire mill machinery as a discussion of the major design features that are necessary in the manufacture of a better product at the lowest possible cost.** ✦ ✦

### Theory of Stranding

WHEN stranding wires, they are bent and twisted at the same time, or bent only, depending on the method used; that is **"planetary stranding"**—taking the twist out, and **"rigid stranding"**—leaving the twist in.

✦ ✦ ✦

### Bending

IF a straight wire of the dia. "d" is wound around the half circumference of a roll of the dia. "D" it will bend from B to $B_1$ and the various layers of the wire will be affected according to their location.

✦ ✦ ✦

THE neutral layer $A\text{-}A_1$ going through the middle axis "O" of the wire and parallel to the middle axis "E" of the roll, divides the wire in longitudinal fibres which maintain their length; all other fibres are being lengthened if above, and shortened if below the neutral layer. $L_o$ is the longest, $L_i$ the shortest fibre.

✦ ✦ ✦

A LAYER $C\text{-}C_1$ vertical to the middle axis "O" remains vertical also after the wire is bent; such a layer cuts the fibres of unchanged lengths in the neutral layer $A\text{-}A_1$. Vertical to neutral layer no material displacement takes place. A layer b x $\triangle$y parallel to neutral layer only its width "b" changes; above the neutral layer "b" becomes larger; "b" changes to a greater extent the larger distance "y".

✦ ✦ ✦

### Twisting (or Torsion)

IF a straight wire of the dia. "d" and the length 1 (see Fig. 3) is twisted when clamped on one end and the other end turned around angle "$\alpha$" with $L_1$ lengthening to:

$$L_1 = \sqrt{1 + \left(\frac{d \times \pi \times \alpha}{360^\circ}\right)^2}$$

IF a wire of the length "L" is twisted the same way, then the length $L_1$ after the torsion is:

$$L_1 = L \sqrt{1 + \left(\frac{d \times \pi \times \alpha}{360^\circ}\right)^2}$$

✦ ✦ ✦

IF one end of a straight wire is twisted around a complete turn, then:

$$\alpha = \frac{360}{L} \text{ and } L_1 = \sqrt{1 + \left(\frac{d \times \pi}{L}\right)^2}$$

✦ ✦ ✦

WHEN twisting a round wire a material displacement does not take place in the direction of the middle axis. Therefore, a cross section vertical to the middle axis maintains its circular form. Displacement of material by twisting a wire is greater than by bending. Therefore, the stresses in the wire are greater by twisting than by bending.

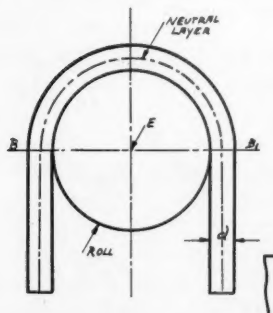

FIG. 1

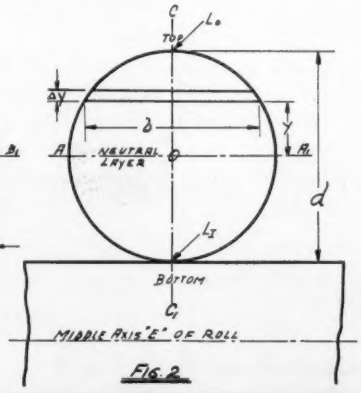

FIG. 2

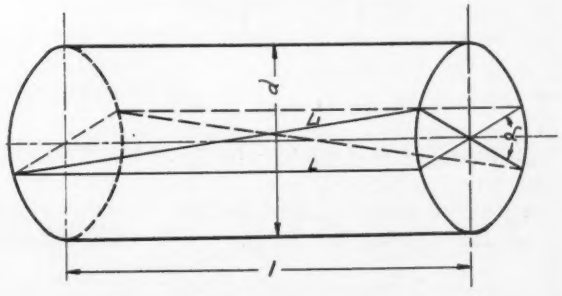

FIG. 3

## Winding & Stranding

THE simplest form of winding is shown in fig. 4. The wire dia. "d" is wound on the cylindrical drum dia. "D" nearly vertical to the drum axis and always with the same longitudinal fibre.

✦ ✦ ✦

IF "$L_i$" is the inside length of the wire of one winding around the drum "D", "$L_o$" the outside length and "L" the original length of the wire, then:

$$L_i = L\sqrt{1-\left(\frac{d \times \pi}{L}\right)^2\left(1+2\frac{D}{d}\right)}$$

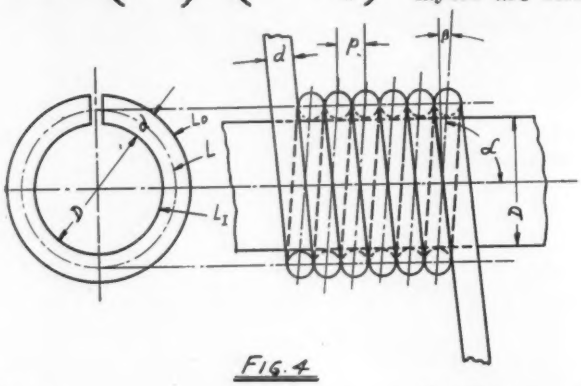


FIG. 4

$$L_o = L\sqrt{1+\left(\frac{d \times \pi}{L}\right)^2\left(3+2\frac{D}{d}\right)}$$

IF $\alpha$, $\alpha_o$ and $\alpha_i$ are the angles of inclination of the spirals L, $L_o$ and $L_i$, then:

$$\tan.\ \beta = \frac{d}{(D+d)\pi}$$

✦ ✦ ✦

$$\tan.\ \beta_o = \tan.\ \beta\left(1+\frac{d}{D}\right) \times \frac{1}{1+2\frac{d}{D}}$$

$$\tan.\ \beta_i = \tan.\ \beta\left(1+\frac{d}{D}\right)$$

✦ ✦ ✦

THE original L, $L_o$ and $L_i$ are equal in length and parallel to each other as a straight wire before winding but will have different lengths and angles of inclination after winding on drum.

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FROM the above formulas it should be noted that each turn wound around the drum is twisted 360°.

✦ ✦ ✦

THE above has shown mathematically that the outside of the wires lengthen and the inside of the wires shorten when they are stranded thereby tending to reduce inner stresses. These stresses are not entirely reduced as a certain amount of stress remains in the individual wires which has the tendency to bring the wires back to its original position. In order to reduce this tendency to a minimum the wire layers are stranded in alternative direction; one layer to the right, the next to the left, etc. By prebending it is possible to entirely eliminate these inner stresses.

✦ ✦ ✦

FOR a greater pitch "p" (p > d) (see fig. 5) use the following simplified formulas:

$$L = \sqrt{p^2 + [\pi(D+d)]^2}$$

$$L_i = \sqrt{p^2 + (\pi \times D)^2}$$

$$L_o = \sqrt{p^2 + [\pi \times (D+2d)]^2}$$

Angle of inclination $\beta$, $\beta_i$ and $\beta_o$ is:

$$\tan.\ \beta = \frac{p}{(D+d) \times \pi}$$

$$\tan.\ \beta_i = \frac{p}{(D+d) \times \pi}$$

$$\tan.\ \beta_o = \frac{p}{(D+2d) \times \pi}$$

The angle of application "$\alpha$" is:

$$\alpha = 90° - \beta$$

✦ ✦ ✦

## The Flexibility of a Stranded Cable

FIGURES 1 and 2 showed the bending characteristic of a solid wire over a roll. Fig. 6 shows the effect of a stranded cable under the same conditions by replacing the solid wire "d" by a 7-wire stranded cable.

✦ ✦ ✦

FIGURE 6 shows 6 wires stranded around the core wire 7. If this cable replaces "d" and is bent around roll "D" (see fig. 1 & 2) the pitch or lay of the cable is of the same length as the solid wire B - $B_1$, that is:

$$p = (D+d)\frac{\pi}{2}$$

✦ ✦ ✦

ON the one end "B" of the bent cable is wire #1 on the point of line $L_o$ and the same cross section wire #4 on the point of line $L_i$. On this place the wire #1 experiences the greatest lengthening and the wire #4 the greatest shortening. Wire #2 and #6 lengthen a small amount less than wire #1 and wire #3 and #5 shorten of the same amount less than wire #4. At a point 1/6 of the pitch further towards point $B_1$ (position "b" fig. 6) it will be found that wire #6 is now on the point of line $L_o$ and on point $L_i$ is wire #3.

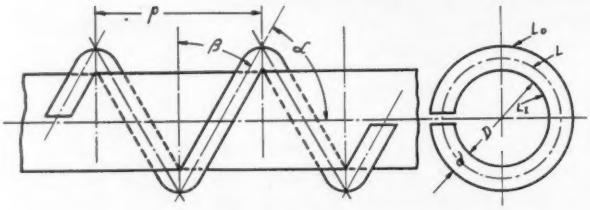


FIG 5

✦ ✦ ✦

THIS shows that, (in the case of 6 wires stranded around one core wire) in every sixth of the pitch the wire moves one sixth around the circle until this procedure repeats itself at the end of the pitch.

✦ ✦ ✦

IF we now consider the 6 wires not continuous and go over stepwise from one location of the wire to the other by every sixth of the pitch with inbetween parallel to cable middle axis, then every wire from B to $B_1$ will experience the same lengthening and

shortening of which the sum of all the wires is O. The shorter the pitch, the nearer the assumption of the step-wise transition of the wires comes to reality; that it is much easier to equalize the real length-differences within the pitch length through axial displacement.

✦ ✦ ✦

ON a stranded cable, therefore, the length-differences between $L_o$ and $L_i$ grow smaller or larger depending on the length of the pitch. The conclusion is, that, the shorter the pitch (lay) the more flexible is the cable.

✦ ✦ ✦

## Back Turn

AS previously stated the wire experiences a torsion of 360° when laid around the core wire once and in fig. 5 the wire "d" winds itself lengthwise with its line $L_i$ around the surface of the core wire.

✦ ✦ ✦

IF now the wire is turned 360° to every pitch in opposite direction of stranding before winding around the core wire, then the wire does not touch the core wire with the same $L_i$. All $L_i$ lines of the wire from one end of the pitch to the other come in contact with the core.

✦ ✦ ✦

THIS means that every $L_i$ takes part in every apparent change of length and therefore maintains its original length per complete pitch. The relatively large deformations within the wires are greatly reduced and consequently the inner stresses are also reduced to a large extent.

✦ ✦ ✦

IN practice the back-turn is done during the process of stranding. Fig. 7 shows the rigid way of stranding, that is without back-turn in which case we assume that the wire is laid around core wire clock wise. The contact between wire and core occurs always on the same $L_i$ while the wire "d" at the same time with its rotation around "D" also turns around its own axis in the same direction, namely clockwise in this case.

✦ ✦ ✦

THE rotation of the wire "d" around its own axis takes place in a natural way. That is, the wire "d" once having taken its position, is maintained rigid throughout the stranding operation. Every point of the cross section of the wire "d" inscribes a circle around the center of core wire "D". For instance: point $L_i$ inscribes the circle of the dia. "D" and $L_o$ inscribes the circle of the dia. D + 2d, etc.

✦ ✦ ✦

FIG. 8 shows the planetary way of stranding, that is with back-turn in which case it is again assumed that the wire "d" is laid around core wire "D" clockwise.

✦ ✦ ✦

IF to apply to wire "d" at the same speed a turn around its own axis in the opposite direction of stranding around core "D" then the twist of 360° per pitch may be eliminated. On any $L_i$ and $L_o$ opposite to each other the diameters $L_i$ - $L_o$ remain parallel. The cross section points of all $L_i$ and $L_o$ rotate on a circle of the diameter D + d of which the center is on a circle of the dia. "d" around the center of "D".

✦ ✦ ✦

A DISCUSSION of stranding machines and some of their features will follow in a later article.

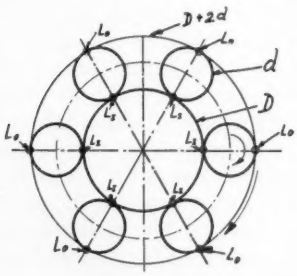


FIG. 7

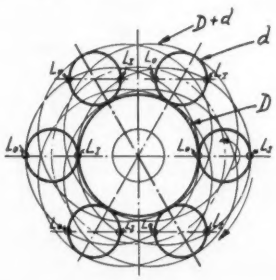


FIG. 8

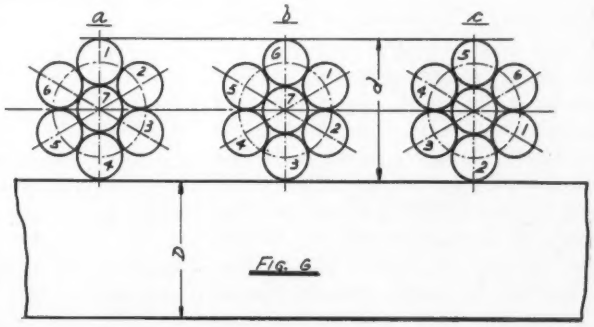


FIG. 6


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300 Main Street, Stamford, Conn.

# Practical Suggestions For Increasing Pickle Room Output

By Walter George See and Walter H. Graham

Submerged Combustion Co. of America,
Hammond, Indiana

An outline of methods by which pickle room production may be increased through the use of present facilities and without courting the danger of over-expansion or raising costs. + + + + +

ALTHOUGH there have been several theories on pickling which have been advanced and quite generally accepted, this article has no intention of dealing with "Theory". What is needed now is the practical application of the knowledge of pickling which has been accumulated thus far in order to meet the ever increasing demand for production. Much can be done to alleviate the pressure in the pickle room by taking full advantage of present facilities and by utilization of some of the new devices for increasing pickle room production without courting the danger of over-expansion or raising costs.

+ + +

IN many plants the pickle room has long been the forgotten department, a necessary evil, and a place to stay out of as much as possible. Today this neglect is plaguing the management of those plants which have installed more and faster drawing machines and straighteners, speeded up handling equipment, but which has neglected to spend any money in the pickle room except for necessary repairs. And yet, it is in this department that the speed and output of the subsequent drawing operation is determined, not just by the quantity of the department's output, but by its quality as well. Any attempt to skimp on the quality of cleaning is invariably done at a sacrifice of drawing speed, quality of finish, and die life.

+ + +

ADMITTEDLY, each pickling department has its own individual problems although each pickles the same type materials. For this reason it is suggested that management assign an engineer or some person capable of making a complete study of his pickling department to check the following suggestions. Do not expect or accept a report in less than a month as it will not be thorough enough to make decisions.

+ + +

VERY few plants today are taking full advantage of present pickling facilities. Management is prone to "add another tub" when it finds pickle room production falling behind the finishing machine demands if, of course, room for it can be found in the building. In some cases new vats are necessary and truly an advantage if the basic lay-out is sound enough to permit modernization and expansion of the department along with the natural growth of the rest of the plant. Yet management has been known to follow the "add another tub" policy without thought of handling equipment or what is yet to come. A fine example of this type of thinking is shown in the following case study. One manufacturer started his pickling department with 3 pickling vats each holding one lift of steel. It was found that it took an average of 20 minutes for the steel to be pickled. Later, it was decided that more pickling capacity was required. After careful study it was thought 2 additional tanks could be built to give a 30% increase in production. The tanks were installed and the expected increase in production was realized from the five tanks. Not long afterwards, however, it was found that an additional 25% capacity was required. The management immediately recalled the previous success obtained when the number of vats was increasd, and so without making further study of the situation two additional tanks were ordered and installed in the department, but the expected increase in production did not materialize. A study showed that the handling facilities were not adequate for the additional tanks. Instead of maintaining the required 20 minute pickling cycle the time had gone up to 30 minutes. This was not because the material was not being pickled in the required 20 minutes but simply because it took the crane 30 minutes to make the cycle around 7 tanks. The crane operator was spending too much time traveling from one tank to another and did not have sufficient time to lift the steel from the tank when it was pickled. It was found that actually less steel was being produced and at a higher cost than previously. Because the steel remained in the tanks longer, the steel loss was greater and more acid was used. Also, more heat was required for the two additional tanks.

+ + +

A LOGICAL solution for this manufacturer would have been to maintain the original three

tanks with the possible addition of one more vat and to increase production by other, more economical and satisfactory means. For instance, it would have been better to have installed agitating equipment which would have increased production considerably. This could have been done by a mechanical rocker arrangement, or better, yet, by means of agitating the solution about the steel either with air or the new method of direct firing which supplies heat and agitation simultaneously. Any of the above means would have enabled the manufacturer to increase production astoundingly.

✦ ✦ ✦

THERE are, however, many manufacturers who feel that the only way to get more production is to "add another tub" because they think that their vats are already producing at top capacity. Perhaps the pickler in your plant is keeping his vats loaded most of the time and perhaps the crane is running almost constantly, but what can be done to keep the vats full more of the time, to speed up the cycle, and to keep the crane more efficiently busy?

✦ ✦ ✦

LET'S take a look. Supposedly, the time cycle of the entire pickling operation controls the output of the pickle room. In main, this cycle consists of loading the vat, actual pickling time, unloading, washing, liming, baking, and unloading from the crane onto a conveyance. In some plants, the practice of rolling the coils half way through the immersion cycle is followed and if so, this must be placed in the total cycle. (Fig. I) All this must be accomplished for each lift going into and out of the tank. Obviously the more time we can save in each of these operations, the more of these cycles can be accomplished in any turn.

✦ ✦ ✦

IN many pickling departments the pickler must make up his own loads. If it is possible to relieve the pickler of this job it allows him more time to pay close attention to his vats which is the work he is being paid to do. In one department where this simple task was taken from the pickler he was able to cut his cycle time 7 minutes which meant an increase in production of 10 to 25%. This is an unusual case but it is mentioned because there are more than a few departments still following this antiquated practice.

✦ ✦ ✦

ANOTHER method of stepping up pickle room production is to increase the crane speed. A faster crane travel will do much in this respect. In a great many pickling departments the craneman can walk much faster than the crane. If the workman has to slow down his pace to match the crane speed it is not only bad for the morale, but also definitely inefficient. Crane travel of 300 feet per minute is not excessive for the monorail type and 350 feet per minute or over is better speed for a gantry crane where the craneman can ride with the load. Even a faster hoist can do much to increase the work output of the pickle room and a lift of 80 to 90 feet per minute is not too fast. Additional tubs will be of little help if the material must lie in the tub long after it is pickled and ready to come out, or if the tubs are not kept full because of the inability of the crane and pickler to place new loads in the empty spaces. A glaring example of this was found in a time study of a pickle room containing two tanks. Over a period of 9 hours and 42 minutes of tank time, there was steel in the vats for a total of only 3 hours and 6 minutes. The cause for this waste of pickling time was found to be the long period taken to prepare the steel and the time consumed by the crane's duties other than serving the two vats Is this your condition?

**FIG. I**
**CHECK CHART OF CYCLE**

| | |
|---|---|
| **Prepare** | **Assemble Stock (Point)** |
| | **Make ready for Pin** |
| **Load** | **Place Coils on Pin** |
| | **Crane Lift and Travel** |
| | **Place and Unhook** |
| **Pickle Cycle** | **Time in Acid (Rolling Time)** |
| **Unload** | **Hook, Lift and Travel** |
| **Wash** | **Wash** |
| | **Travel to Lime** |
| **Lime** | **Lime (Travel to Baker)** |
| **Baker** | **Baking Time** |
| **Unload** | **Hook and Unhook** |

✦ ✦ ✦

BESIDES speeding up the crane, its work out-put can be increased by decreasing the time for each specific operation. For instance, is the yoke or pin your plant is using the best and easiest handled for your application? If you follow the practice of rolling the coils half way through the cycle, how far does the crane have to travel to the place where the coils are rolled, and how far do they have to be lowered and raised for this operation? In many plants a platform nearer the tub top level can be built to save hoist and let down time in this operation. Proper pitch to this platform makes the rolling operation easier and faster.

✦ ✦ ✦

IF you don't use a baker, or even if you do, preliminary drying at the lime vat can be hastened by the use of an air stream over the material when it comes out of the hot solution. The air to do this job need not be hot, although it is better if it is at least warm. If you do bake your lime, is this a bottleneck in your pickle room? Is your baker handling the material as quickly as you can pickle it and still baking the lime in the manner you believe best for your particular plant conditions? Have you ever tried decreasing baking time to discover the absolute minimum baking time necessary for your operation?

✦ ✦ ✦

ANOTHER method of saving time is to use quick opening valves in the washing operation. Even where spray washing is not used as yet this simple point will save from 10 to 15 seconds in washing over the hand wheel type.

✦ ✦ ✦

IN a plant recently visited, the pickle department had a straight line layout handled by an exceptionally fast gantry crane and an automatically controlled spray washing system. The speed

of charging, unloading, washing and liming of this combination was phenomenal. When the crane stopped over the center of the wash pit, high pressure water was automatically turned on and sprayed the coils quickly and thoroughly. As the crane moved off the relay the water was turned off. The system was efficient, very fast, and quite simple.

✦ ✦ ✦

EACH bit of time saved in crane time and washing can be utilized to the advantage of production. If your plant is fortunate enough to have ample crane and handling facilities, then the remainder of the problem, namely that of increasing the actual pickling speed is relatively simple.

✦ ✦ ✦

WE come now to the part of the cycle which is not controlled by the handling equipment . . . namely the actual cleaning cycle or time taken by the acid to do its work. Although management, or at least the immediate supervisors should have accurate information relative to solution strength, dumping point of the vat, temperature and inhibitor control, a survey made by **Dr. Willard Hodges of the Mellon Institute** shows that where management has been able to give definite answers as to solution strength, acid and iron content at dumping time, check test showed that these figures were little better than estimations. Even rigid rules laid down by supervisors have a way of slipping if not checked constantly for accuracy. How long has it been since the controls laid down for your cleaning department have been checked by an unbiased party? The results may surprise you.

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IF you have run sufficient tests to determine the optimum concentration of solution for the temperature at which you desire to run, then it remains only to keep the solution at that concentration and temperature as constantly as possible. If, however, you have not run the test necessary to learn the proper combination of acid and temperature for your particular work, then this work should be done at once. It can be worked out rather simply by varying the acidity and temperature combinations and noting the results without disrupting pickle room production, and may prove to be a source of considerable increase in production.

✦ ✦ ✦

SOME preliminary work has been done with wetting agents in both pickle and lime solutions, and a few plants are now using these agents to reduce the surface tension of the pickle liquor. Although results from the use of wetting agents are rather difficult to evaluate, a faster run-off or drainage is effected which tends to reduce acid loss from drag-outs. Also a better penetration of acid under the edges of the scale is believed to be effected.

✦ ✦ ✦

MANY plants check their acid and iron content at the beginning and end of the shift, yet if any volume of tonnage or surface area is passing through the vats, acid content may vary widely during this period. If high temperatures are used, the effect of dilution will definitely tend to weaken the solution. Smaller and more frequent additions will keep the acid content at a more even percentage and should be kept up until the iron content nears the point where the solution should be dumped. As the iron content builds up, the action of the acid is naturally slowed but this can be compensated for by raising the solution temperature near the end of the run. This is more or less common practice in many plants and does tend to save a little on acid and helps to maintain production speed as the iron builds up. However, many people who watch their acid costs closely overlook the fact that the savings in acid thus effected is, at least in part, eaten up by the increase in

**Figure II. Example of table showing number of gallons of acid to add**

**NUMBER OF GALLONS OF ACID TO ADD FOR No. 2 VAT**

Strength Required

| Present Strength | 1/2 | 1 | 1-1/2 | 2 | 2-1/2 | 3 | 3-1/2 | 4 | 4-1/2 | 5 | 5-1/2 | 6 | 6-1/2 | 7 | 7-1/2 | 8 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 32 | 64 | 96 | 127 | 159 | 191 | 222 | 254 | 287 | 318 | 350 | 382 | 414 | 446 | 478 | 50[illegible] |
| 1/2 | | 32 | 64 | 96 | 127 | 159 | 191 | 222 | 254 | 287 | 318 | 350 | 382 | 414 | 446 | 478 |
| 1 | | | 32 | 64 | 96 | 127 | 159 | 191 | 222 | 254 | 287 | 318 | 350 | 382 | 414 | 446 |
| 1-1/2 | | | | 32 | 64 | 96 | 127 | 159 | 191 | 222 | 254 | 287 | 318 | 350 | 382 | 414 |
| 2 | | | | | 32 | 64 | 96 | 127 | 159 | 191 | 222 | 254 | 287 | 318 | 350 | 382 |
| 2-1/2 | | | | | | 32 | 64 | 96 | 127 | 159 | 191 | 222 | 254 | 287 | 318 | 350 |
| 3 | | | | | | | 32 | 64 | 96 | 127 | 159 | 191 | 222 | 254 | 287 | 318 |
| 3-1/2 | | | | | | | | 32 | 64 | 96 | 127 | 159 | 191 | 222 | 254 | 287 |
| 4 | | | | | | | | | 32 | 64 | 96 | 127 | 159 | 191 | 222 | 254 |
| 4-1/2 | | | | | | | | | | 32 | 64 | 96 | 127 | 159 | 191 | 222 |
| 5 | | | | | | | | | | | 32 | 64 | 96 | 127 | 159 | 191 |
| 5-1/2 | | | | | | | | | | | | 32 | 64 | 96 | 127 | 159 |
| 6 | | | | | | | | | | | | | 32 | 64 | 96 | 127 |
| 6-1/2 | | | | | | | | | | | | | | 32 | 64 | 96 |
| 7 | | | | | | | | | | | | | | | 32 | 64 |
| 7-1/2 | | | | | | | | | | | | | | | | 32 |
| 8 | | | | | | | | | | | | | | | | |

**To find number of gallons to add find present strength of solution and then read straight across to the vertical line showing required strength.**

the heating cost of running the tub at a higher temperature. This is especially true where tub temperatures are boosted to 190 and 195 degrees Fahrenheit.

✦ ✦ ✦

A SIMPLE table which shows exactly how many gallons or pounds of acid to add to bring the acidity up to the desired point for a specific tank can be worked out very easily. (Fig. II) When the pickler tests his solution he can refer to his chart to determine exactly the amount of acid to add to bring the solution up to the required strength. The figures are very easy to compile and will be of real use to the pickler in eliminating guesswork and keeping his tanks "right."

✦ ✦ ✦

IN conjunction with the small and frequent additions of acid, there is a relatively inexpensive acid meter on the market which is giving good service. The use of a meter of this type speeds up the addition of acid and also gives a complete record of the acid used over any given period of time. Furthermore, it eliminates the old measuring tank which has a habit of overflowing now and then.

✦ ✦ ✦

A SIMPLE control system should be set up so that a running record can be kept of acidity, temperature, iron content and also of the acid and inhibitor used. (Fig. III) In making up the control sheet, remember that your pickler is not an office worker used to writing figures so give him enough room to put them in the space where they belong. If the acid and iron tests are not run by a lab. assistant, they should be checked at least once a day by the supervisor to make sure the recorded information is correct. Inaccurate information is worse than useless and this independent check will tend to keep the men on their toes. Perhaps the following incident which was observed recently will make this point clear. The pickler had turned on the acid to "sweeten" his bath and then had promptly forgotten about it. When he finally remembered to close the valve, the test showed acidity to be 28%. However, the acidity at this point was listed on the control sheet at 8% because this was the highest the pickler was supposed to use.

**FIGURE III**

Department ..... Vat Number ..... Date .....

| Time | Temp. | Acid Content | Acid Added | Iron Content | Inhibitor Added | Lime Added |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |

| | 1st Turn | 2nd Turn | 3rd Turn | Total |
|---|---|---|---|---|
| New Tub | | | | |
| Tub Dump | | | | |
| Acid Meter Start | | | | |
| Acid Meter End | | | | |
| Acid Used | | | | |
| Tonnage | | | | |

✦ ✦ ✦

PROBABLY one of the greatest factors in increasing production without resorting to the extreme temperatures is Agitation. It has long been known that an aerated solution pickles much faster and also gives a better cleaning because it forces the acid through the strands of wire. The application of cold air to the bath does have the disadvantage of considerably increasing the cost of heating the solution with steam and at the same time increases dilution. There is, however, a direct firing, submerged combustion burner on the market which not only generates the heat directly in the solution, but agitates it at the same time. These burners have been described in past issues of **Wire and Wire Products** and have shown remarkable production increases and economies in many well known plants.

✦ ✦ ✦

FINALLY, one of the better ways to get more production out of the pickle room is to clean up the department so that the superintendent doesn't mind walking through the place and is willing to spend as much time there as he does in other departments. The pickler will then not only have better supervision, but if the pickle room is cleaner and drier he can spend more time thinking of pickling instead of cussing the place and worrying about his shoes lasting only a week. Given decent operating conditions and equipment, your pickler can do much to increase the amount and quality of the work turned out of his department.

If You Are Not A Member Of The Wire Association—Now Is A Good Time To Join!
The Annual Dues Are $10.00—For detailed information address
RICHARD E. BROWN, Secretary
300 Main Street THE WIRE ASSOCIATION Stamford, Conn.

# And That's How Barbed Wire Started And Grew

By W. O. Schultz,
Longview, Texas

SOME years ago I got entangled in a barbed wire fence, and while in the hospital afterwards my curiosity was aroused as to the origin of barbed wire. Previously I had casually wondered about the stuff, but this time I was determined to look into the history of this barbed cruelty.

+ + +

FIRST of all, why had barbs been put on the wire; who invented it; when; where and why? I found an interesting background behind the ordinary type of old barbed wire that cannot be overlooked—barbed wire is the climax in the evolution of fence-building which had its greatest period of trial and error development in the Great Plains.

+ + +

THE history of the evolution of the fence might fall under five important heads.

+ + +

FIRST, there was a need of fences. Farming and dairying were impossible while such numerous herds were at large on the Plains. So numerous were cattle in some localities that their value was practically nothing at times. Even droughts did not kill them off sufficiently to help conditions much.

+ + +

SECOND, came the experimentation in various types and kinds of fences. When fences manufactured for use in the East proved unsuited to the Plains, many new fences were contrived by the mind and hand of the Midwesterner.

+ + +

THIRD, the invention and spread of barbed wire took place. Barbed wire was not the result of a single moment's thought. Neither was it handed to the Great Plains from some scientist's laboratory. It was the product of the Plains; invented by practical farmers, and soon in demand by men of the soil, cattlemen and farmers.

+ + +

FOURTH, there were the difficulties in the spread of the fence after it was invented. Barbed wire was a God-send, but its value was not fully realized at first.

+ + +

FIFTH, came the supremacy of the fence.

+ + +

DURING the age of the fence, an age when so many fences are present, one does not appreciate fully the difficulties a scarcity of them causes. During the pioneer days of the Great Plains, there was such a scarcity of fencing materials that fences could not be built except at prohibitive expense. In fact, so scarce was everything, except grass, that it seemed that life for the agriculturist was impossible.

+ + +

THE earlier fences in the Plains were limited to pens and small pastures, and these were not numerous. Rails were used most of the time, but sometimes rock and brush were used. But there was a great need to supplant rail, plank and rock.

+ + +

ALL of these and the numerous other types of fences were more of experiment than of real value. But experimentation could be afforded where a solution meant life itself.

THE hedge became extremely popular as a fence in the early '50's This hedge is the bois d'arc or osage orange hedge. Its fruit is commonly known as the horse apple.

+ + +

BECAUSE of their greater need for fences, it is a correct assumption that the Midwest States should lead in the number of fences made. And barbed wire is a product of the Midwest.

+ + +

JOSEPH FARWELL GLIDDEN is the outstanding name in the early annals of barbed wire. It is he who is accredited with the invention of it. At the time he first experimented with wire he was a practical farmer of DeKalb, Illinois. Prior to his farming experiences, he had been a school teacher. **Isaac L. Ellwood** was an early contender for the title of inventor. And closer still was **Jacob Haish,** who had filed his application for a patent June 17, 1874, before Glidden's patent was granted. When their two applications met in the patent office there was a conflict that cost both men much money.

+ + +

MR. GLIDDEN and his employee made their first barbed wire in a barn, the barbs being short wires made by bending them in an old coffee mill. After they were bent to shape, the barbs were slipped on the wire and placed and tapped with a hammer to prevent their slipping towards the ends. Then an old grindstone handle was utilized to twist a wire around the first wire that had the barbs on

(*Please turn to Page 160*)

# Outstanding Personalities of the Wire Industry

## Eugene G. Grace Is Awarded Bessemer Gold Medal; British Iron and Steel Institute Honors Industrialist

E. G. GRACE, President of Bethlehem Steel Company has been awarded the Bessemer Gold Medal for 1942 by the British Iron and Steel Institute in recognition of his achievements in "fostering collaboration between the steel industries of two leading nations in a great world crisis," it is announced by the British Press Service, 30 Rockefeller Plaza, New York City.

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FOUNDED in 1874, in honor of **Sir Henry Bessemer,** the Bessemer Gold Medal has become the most highly prized international award for achievement in the steel industry. In its 45 years, the Medal has been awarded previously to only three other Americans —**Andrew Carnegie, Charles M. Schwab,** and **Albert Sauveur,** who was the first American metallurgist.

✦ ✦ ✦

MR. GRACE was notified of the award in Washington by **Ian Elliot,** member of the Council of the British Iron and Steel Institute, acting upon cabled advices from **John Craig**, President of the Institute in London.

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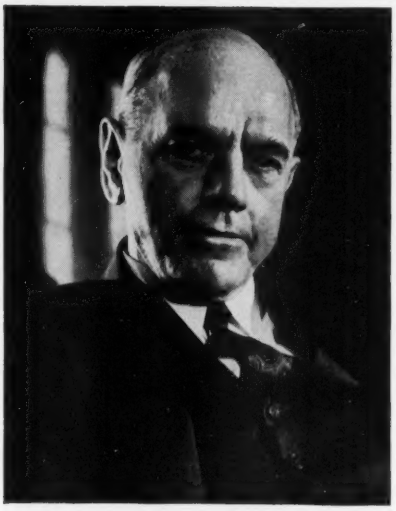
CHARACTERIZING Mr. Grace as the "acknowledged leader of the steel industry in America," Mr. Elliot said the award was an "appropriate symbol of the pooling of the technical skill as well as the resources of the United States and Great Britain in an anti-Axis world."



EUGENE GIFFORD GRACE

✦ ✦ ✦

"THE importance of industry in modern mechanized warfare," said Mr. Elliot, "puts the steel industry in the forefront of the war effort. Today industrialists play as direct a part as generals in the fighting, thus the honor paid to Mr. Grace may be regarded as a war tribute, paralelling that given great military leaders in actual conflict."

✦ ✦ ✦

IN acknowledging the honor, Mr. Grace said:

**"In accepting this award it would be selfish on my part not to recognize that the services attributed to me by the Institute's generous citation reflect as well the team work and cooperative efforts of my associates in Bethlehem Steel and the American steel industry as a whole."**

✦ ✦ ✦

MR. GRACE has spent his entire adult life in the steel industry. Upon graduating at the head of his class from Lehigh University in 1899, he entered the employ of Bethlehem Steel Company at its Bethlehem, Pa., plant. He began by running an electric crane and advanced rapidly through various positions to the office of president of the company in 1913.

✦ ✦ ✦

DURING his presidency of the Bethlehem Company, the ingot capacity of the corporation has risen from 950,000 net tons to more than 12,000,000, becoming the second largest steel producing concern in the world now employing more than 190,000 workers.

✦ ✦ ✦

AT the outset of the present conflict, Mr. Grace was a leader in converting the huge commercial facilities of his organization to war production with the result that he is now administering the largest, single American enterprise producing steel, ships, ordnance products and other material for the Allied nations. He holds degrees of Electrical Engineering, Doctor of Engineering and Doctor of Laws. He was awarded the Gary Medal in 1934 and served as president of the American Iron and Steel Institute in 1935 and 1936.

## H. H. Passolt, Wire Mill Supt., Page Steel & Wire Division, American Chain & Cable Co., Inc., Monessen, Pa.

THE appointment is announced of **H. H. Passolt** as wire mill superintendent of the Page Steel & Wire Division of the American Chain & Cable Company, Inc., Monessen, Pa., succeeding **Mr. R. R. Preston.**

MR. PASSOLT is a graduate of the University of Michigan, class of 1925. He studied Metallurgical Engineering and immediately after graduation he started to work for the Michigan Copper & Brass Co., Detroit, Michigan. In 1926 he went with the Bridgeport Brass Company.

✦ ✦ ✦

HE started with the American Chain & Cable Company in 1927 as a Development Metallurgist at Bridgeport, Conn., and in 1937 he was transferred to the Page Steel & Wire Division as a Development Metallurgist.

✦ ✦ ✦

FOR two years prior to his appointment as Wire Mill Superintendent, Mr. Passolt had been in charge of the production of stainless steel at the Page plant.

*(Please turn to Page 163)*

# STATISTICS --- DECEMBER, 1941
## PRODUCTION FOR SALE OF IRON AND STEEL PRODUCTS

**AMERICAN IRON AND STEEL INSTITUTE**
**Capacity and Production for Sale of Iron and Steel Products**

December - 1941

| | | Number of companies | Items | Annual Capacity Net tons | Production for Sale—Net Tons | | | | Year to Date | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Current Month | | | | | | | |
| | | | | | Total | Per cent of capacity | Shipments Export * | Shipments To members of the industry for conversion into further finished products | Total | Per Cent of capacity | Shipments Export * | Shipments To members of the industry for conversion into further finished products |
| Steel Products | Ingots, blooms, billets, slabs, sheet bars, etc. | 42 | 1 | xxxxxxxx | 611,921 | xxx | | 173,635 | 6,925,892 | xxx | | 2,078,405 |
| | Heavy structural shapes | 9 | 2 | 5,248,400 | 368,773 | 82.9 | | xxxxxxxx | 4,586,652 | 87.4 | | xxxxxxxx |
| | Steel piling | 4 | 3 | 422,000 | 43,615 | 121.9 | | xxxxxxxx | 365,999 | 86.7 | | xxxxxxxx |
| | Plates—Sheared and Universal | 20 | 4 | 5,654,360 | 635,812 | 132.6 | | 7,031 | 6,027,001 | 106.6 | | 40,466 |
| | Skelp | 8 | 5 | xxxxxxxx | 72,702 | xxx | | 46,008 | 994,989 | xxx | | 546,026 |
| | Rails—Standard (over 60 lbs.) | 4 | 6 | 3,613,600 | 131,263 | 42.9 | | xxxxxxxx | 1,708,464 | 47.3 | | xxxxxxxx |
| | Light (60 lbs. and under) | 6 | 7 | 302,800 | 10,329 | 40.2 | | xxxxxxxx | 165,572 | 54.7 | | xxxxxxxx |
| | All other (Incl. girder, guard, etc.) | 2 | 8 | 102,000 | 2,214 | 25.6 | | xxxxxxxx | 28,730 | 28.2 | | xxxxxxxx |
| | Splice bar and tie plates | 15 | 9 | 1,312,200 | 44,832 | 40.3 | | xxxxxxxx | 675,735 | 51.5 | | xxxxxxxx |
| | Bars—Merchant | 44 | 10 | xxxxxxxx | 557,446 | xxx | | 67,700 | 6,425,670 | xxx | | 752,174 |
| | Concrete reinforcing—New billet | 20 | 11 | xxxxxxxx | 149,011 | xxx | | xxxxxxxx | 1,639,256 | xxx | | xxxxxxxx |
| | Rerolling | 20 | 12 | xxxxxxxx | 18,389 | xxx | | xxxxxxxx | 253,095 | xxx | | xxxxxxxx |
| | Cold finished—Carbon | 25 | 13 | xxxxxxxx | 105,224 | xxx | | xxxxxxxx | 1,243,962 | xxx | | xxxxxxxx |
| | Alloy—Hot rolled | 19 | 14 | xxxxxxxx | 168,273 | xxx | | 32,517 | 1,903,758 | xxx | | 283,079 |
| | Cold finished | 19 | 15 | xxxxxxxx | 19,916 | xxx | | xxxxxxxx | 198,201 | xxx | | xxxxxxxx |
| | Hoops and baling bands | 5 | 16 | xxxxxxxx | 7,342 | xxx | | xxxxxxxx | 111,226 | xxx | | xxxxxxxx |
| | TOTAL BARS | 68 | 17 | 13,354,985 | 1,025,601 | 90.6 | | 100,217 | 11,775,168 | 88.2 | | 1,035,253 |
| | Tool steel bars (rolled and forged) | 17 | 18 | 187,550 | 14,926 | 93.9 | | xxxxxxxx | 153,953 | 82.1 | | xxxxxxxx |
| | Pipe and tube—B. W. | 16 | 19 | 2,242,040 | 156,023 | 82.1 | | xxxxxxxx | 1,768,253 | 78.9 | | xxxxxxxx |
| | L. W. | 8 | 20 | 895,260 | 38,747 | 51.1 | | xxxxxxxx | 485,270 | 54.2 | | xxxxxxxx |
| | Electric weld | 7 | 21 | 1,071,020 | 57,247 | 63.1 | | xxxxxxxx | 726,507 | 67.8 | | xxxxxxxx |
| | Seamless | 15 | 22 | 2,997,160 | 186,880 | 73.6 | | xxxxxxxx | 2,183,348 | 72.8 | | xxxxxxxx |
| | Conduit | 8 | 23 | 174,140 | 13,486 | 91.4 | | xxxxxxxx | 161,328 | 92.6 | | xxxxxxxx |
| | Mechanical Tubing | 10 | 24 | 399,000 | 31,454 | 93.0 | | xxxxxxxx | 350,172 | 87.8 | | xxxxxxxx |
| | Wire rods | 22 | 25 | xxxxxxxx | 118,463 | xxx | | 18,464 | 1,495,945 | xxx | | 248,316 |
| | Wire—Drawn | 41 | 26 | 2,293,490 | 190,354 | 97.9 | | 2,440 | 2,307,623 | 100.6 | | 23,112 |
| | Nails and staples | 18 | 27 | 1,153,930 | 57,647 | 58.9 | | xxxxxxxx | 782,234 | 67.8 | | xxxxxxxx |
| | Barbed and twisted | 16 | 28 | 474,210 | 24,383 | 60.7 | | xxxxxxxx | 279,780 | 59.0 | | xxxxxxxx |
| | Woven wire fence | 16 | 29 | 777,785 | 19,350 | 29.3 | | xxxxxxxx | 296,506 | 38.1 | | xxxxxxxx |
| | Bale ties | 11 | 30 | 110,970 | 5,468 | 58.1 | | xxxxxxxx | 81,554 | 73.5 | | xxxxxxxx |
| | All other wire products | 8 | 31 | 62,380 | 3,679 | 69.6 | | xxxxxxxx | 39,118 | 62.7 | | xxxxxxxx |
| | Fence posts | 13 | 32 | 122,165 | 4,581 | 44.2 | | xxxxxxxx | 67,553 | 55.3 | | xxxxxxxx |
| | Black plate | 11 | 33 | 340,030 | 58,152 | 201.7 | | 78 | 474,433 | 139.5 | | 175 |
| | Tin plate—Hot rolled | 7 | 34 | 515,620 | 46,060 | 105.4 | | xxxxxxxx | 382,834 | 74.2 | | xxxxxxxx |
| | Cold reduced | 11 | 35 | 3,658,540 | 320,706 | 103.4 | | xxxxxxxx | 3,183,051 | 87.0 | | xxxxxxxx |
| | Sheets—Hot rolled | 29 | 36 | xxxxxxxx | 551,121 | xxx | | 16,579 | 7,466,687 | xxx | | 201,744 |
| | Galvanized | 16 | 37 | xxxxxxxx | 100,532 | xxx | | xxxxxxxx | 1,621,635 | xxx | | xxxxxxxx |
| | Cold rolled | 18 | 38 | xxxxxxxx | 201,711 | xxx | | xxxxxxxx | 3,024,960 | xxx | | xxxxxxxx |
| | All other | 13 | 39 | xxxxxxxx | 52,616 | xxx | | xxxxxxxx | 742,001 | xxx | | xxxxxxxx |
| | TOTAL SHEETS | 31 | 40 | 13,347,160 | 905,980 | 80.1 | | 16,579 | 12,855,283 | 96.3 | | 201,744 |
| | Strip—Hot rolled | 25 | 41 | 3,291,430 | 152,963 | 54.8 | | 18,362 | 2,013,436 | 61.2 | | 245,212 |
| | Cold rolled | 40 | 42 | 1,553,110 | 105,719 | 80.3 | | xxxxxxxx | 1,322,066 | 85.1 | | xxxxxxxx |
| | Wheels (car, rolled steel) | 5 | 43 | 422,820 | 25,602 | 71.4 | | xxxxxxxx | 268,165 | 63.4 | | xxxxxxxx |
| | Axles | 7 | 44 | 453,470 | 20,371 | 53.0 | | xxxxxxxx | 201,553 | 44.4 | | xxxxxxxx |
| | Track spikes | 11 | 45 | 325,770 | 14,221 | 51.5 | | xxxxxxxx | 171,113 | 52.5 | | xxxxxxxx |
| | All other | 8 | 46 | 78,600 | 7,686 | 115.4 | | xxxxxxxx | 56,408 | 71.8 | | xxxxxxxx |
| | TOTAL STEEL PRODUCTS | 171 | 47 | xxxxxxxx | 5,527,210 | xxx | | 382,814 | 65,361,688 | xxx | | 4,418,709 |
| | Pig iron, ferro manganese and spiegel | 31 | 48 | xxxxxxxx | 754,211 | xxx | | 303,870 | 8,190,933 | xxx | | 2,846,174 |
| | Ingot moulds | 5 | 49 | xxxxxxxx | 77,456 | xxx | | xxxxxxxx | 821,230 | xxx | | xxxxxxxx |
| Iron Products | Bars | 13 | 50 | 175,915 | 10,221 | 68.5 | | 675 | 102,924 | 58.5 | | 6,008 |
| | Pipe and tubes | 3 | 51 | 109,300 | 6,969 | 75.2 | | xxxxxxxx | 71,152 | 65.1 | | xxxxxxxx |
| | All other | 2 | 52 | 71,000 | 2,286 | 38.0 | | - | 22,993 | 32.4 | | - |
| | TOTAL IRON PRODUCTS (ITEMS 50 to 52) | 15 | 53 | 291,715 | 19,476 | 78.8 | | 675 | 197,069 | 67.6 | | 6,008 |

Total Number of Companies Included - 196.

During 1940, The Companies Included Above Represented 98.0% of the Total Output of Finished Rolled Products.

* In accordance with Government Policy, Export Figures Cannot Be Published.


If You Are Not A Member Of The Wire Association—Now Is A Good Time To Join!
The Annual Dues Are $10.00 — For detailed information address
RICHARD E. BROWN, Secretary
300 Main Street, THE WIRE ASSOCIATION Stamford, Conn.

# ✦ GOVERNMENT WIRE PRODUCTION INFORMATION ✦

## Price Ceilings on Wire and Cable

FORMAL price ceilings on wire, cable and cable accessories at the October 15, 1941 levels are established in Price Schedule No. 82, issued January 30, 1942 by **Leon Henderson,** Administrator, Office of Price Administration. The Schedule becomes effective immediately.

✦ ✦ ✦

THIS order supplants the informal request made to the industry on October 29, 1941 to maintain prices at not above the October 15 figures.

✦ ✦ ✦

THE final schedule was prepared after careful consideration had been given to industry suggestions made at three meetings, as well as written comments on a proposed price schedule, previously submitted to all members of the industry. Following studies of costs and other factors relevant to production and sale of wire and cable products, it was decided that October 15 prices are fair and equitable, Mr. Henderson stated.

✦ ✦ ✦

PRINCIPAL changes from the proposed price schedule submitted to the industry and the final schedule are as follows:

**1. Maximum charges for drawing wire or rolling bars are provided.**

## Exports and Imports of Wire

**AS a wartime measure to prevent vital information being given to the enemy, the Bureau of the Census has suspended publication of the "Monthly Summary of Foreign Commerce of the United States," beginning with the October issue. As soon as this suspension order is rescinded, we will resume publication of Exports and Imports data.**

**2. Maximum price for weatherproof wire has been raised. This is due largely to sharp cotton price advances resulting in higher cost of cotton yarns used therein, and takes account of the special competitive situation existing on October 15 last. Weatherproof wire maximum base price has been raised 2.375 cents per pound over October 15 levels to 17.5 cents.**

**3. Contract provision for price adjustment is limited to deliveries called for and made more than nine months from the date of contract. In such cases, final prices may not exceed maximum prices in effect at the date of delivery.**

✦ ✦ ✦

REQUESTS for relief have been received from some companies manufacturing armored conductor cable, Mr. Henderson stated. These requests are under consideration currently and, the Administrator said, "It is anticipated that a decision will be reached within the very near future, with the possibility that the ceiling order may be revised

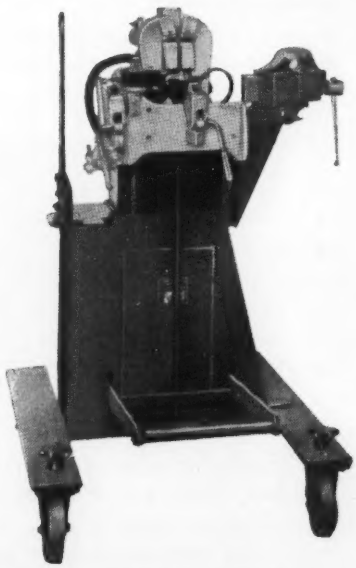
(*Please turn to Page 154*)

MICROMETER PRECISION MICRO-WELD TRADE MARK REG. U. S. PAT. OFF.

CONTINUOUS IMPROVEMENT

MICRO-WELDERS with dial indicating annealing attachments are now available for high carbon wire.

There is positive control of annealing temperature and already hundreds of these special MICRO-WELDERS are proving their dependability and satisfactory performance with leading manufacturers.



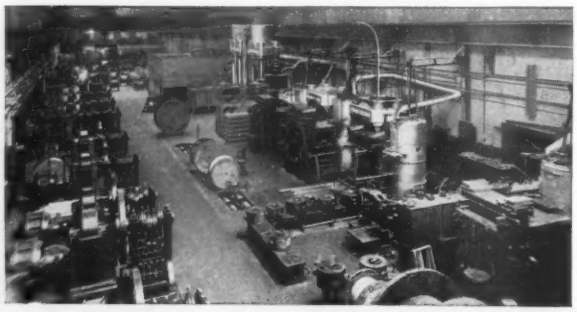
MICRO PRODUCTS COMPANY
20 NORTH WACKER DRIVE, CHICAGO, ILL.
Telephone, State 7468

# BROADWAY-1882 "BTUE"

"B T U E" — BEFORE THE UNDERGROUND EMPIRE of telephone communications, city streets were a mess of unsightly wires and poles—as shown in this photograph of Broadway in 1882.

Now, cities are sightly, because one underground lead encased cable of but 2⅝" diameter, holds sufficient wires to carry on 2121 conversations at one time.

The John Robertson Co. is proud of the part it has played in pioneering the development of cable lead encasing equipment, for a good part of the lead-encased cable, has been made with Robertson products.



Battery of Robertson Lead Cable Encasing Presses with lead melting pots at a large electrical manufacturing plant.

Robertson makes all types of lead encasing machinery for rubber hose and electrical cable manufacturers.

**JOHN ROBERTSON CO., INC.**

125-137 Water St., Brooklyn, N.Y.


## Government Wire Production Information

(*Continued from Page 153*)

after it is issued, or exceptions granted."

✦ ✦ ✦

ANOTHER feature of the new price schedule is an adjustment to cover about 50% of the recent .65-cent increase in lead prices. Manufacturers of lead-covered cable will be expected to absorb the remainder of this cost increase. It is emphasized that this provision in the order is temporary and subject to modification subsequently when OPA has studied data showing the effects of the lead price increase on costs and profits. Firm prices with no rebates on sales made during this period of study are permitted by OPA, however.

✦ ✦ ✦

IT was pointed out that since January 1, 1941, prices of many types of electrical wire and cable have been raised between 5% and 25%. Output of these products is essential to both this country's war program and civilian economy. Hence, the formal price ceiling is considered necessary.

✦ ✦ ✦

## Government Delivered Prices for Specific Wire Products

PRICE Schedule No. 49—Resale of Iron and Steel Products becoming effective December 15, 1941, was issued under Title 32—National Defense, Chapter XI, Office of Price Administration, Part 1306, Iron and Steel, and included the regulations covering the maximum delivered prices for certain specific wire products.

✦ ✦ ✦

THIS Government order reads as follows:

✦ ✦ ✦

(1) NOTWITHSTANDING the provisions of any other section of this Schedule, the maximum delivered price of less-than-carload quantities of standard wire nails, annealed smooth wire, and galvanized smooth wire, in the city or free delivery area in which the seller is located, shall be the aggregate of:

(i) Mill straight carload price,

(after deducting the regular jobber allowance of 15c per cwt.),
(ii) Carload freight from the nearest mill Basing Point to warehouse, and

(iii) One of the following: For standard wire nails—50c per cwt.; for annealed smooth wire—60c per cwt.; for galvanized smooth wire —68c per cwt.

+ + +

(2) THE maximum delivered price of less-than-carload quantities of standard wire nails, annealed smooth wire, and galvanized smooth wire at any other place, shall be the price (as computed above) in any city and less-than-carload freight from such city.

+ + +

(3) ON all merchant wire products, whether covered by subparagraphs (1), (2) or (4) of this paragraph, extras charged by jobbers and dealers on merchant wire products shall be the same as regular published mill extras in effect as of April 16, 1941, and deductions customarily granted as of April 16, 1941, shall be deducted in computing the maximum delivered price. On standard wire nails, annealed smooth wire and galvanized smooth wire, for which maximum prices are established above, deductions shall be in the same ratio to these maximum prices as they were to prices existing on April 16, 1941.

+ + +

(4) THE maximum delivered prices for less than carload quantities of all other merchant wire products shall be computed as otherwise provided in this Schedule.

+ + +

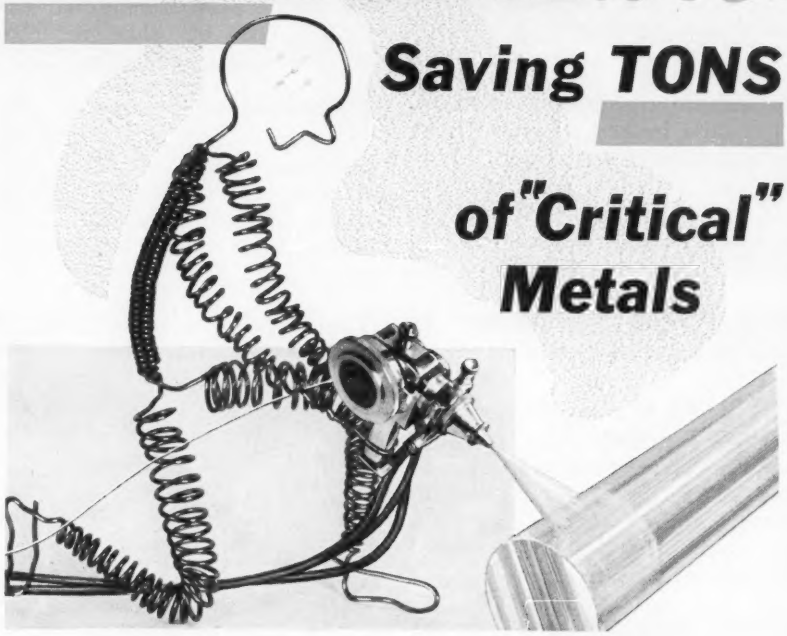
(5) THE maximum prices for mixed or straight carloads of merchant wire products are established by §1306.159 (k) (3).

+ + +

(6) THIS section establishes maximum prices to be charged to dealers and quantity purchasers (as noted below) of merchant wire products, and does not establish a maximum price for sales by retail dealers (such as retail hardware stores, retail

(*Please turn to Page 156*)


**POUNDS of KEYSTONE Wire Saving TONS of "Critical" Metals**



**Through the MOGUL Metallizing Gun**

Here's a recent dramatic example of "industrial salvaging"—

*Case:* a huge steel hoisting engine shaft — diameter 17¼ in., length 27½ feet, weight 18 tons — worn down beyond usefulness at several points. This shaft vital to daily production of a large midwestern copper mine.

*Treatment:* Worn places built up with a correct analysis steel (in the form of Keystone wire) sprayed on by a MOGUL Metallizing Gun. Then finished machined.

*Result:* 200 lbs. of Keystone wire restores an expensive 18-ton shaft to service within a week — at a great saving in precious material, machine time and man hours.

"Pounds to Save Tons" is the significant slogan identified with the Mogul Metallizing Gun for its service of salvaging many types of industrial parts — from small ones to immense ones. We are proud that the Metallizing Company of America finds Keystone wire completely satisfactory for this unique service.

KEYSTONE

STEEL & WIRE CO. Dept. W PEORIA, ILLINOIS

HIGH CARBON OR LOW CARBON

SAMSON SPRING WIRE

REG. U.S. PAT. OFF. KEYSTONE STEEL & WIRE CO. PEORIA, ILL.

Bright-Tinned Coppered Annealed Galvanized

### Government Wire Production Information

(*Continued from Page 155*)

lumber yards, or mail order houses) to consumers: **Provided,** That sales by any person of nails in quantities of more than 25 kegs or other merchant wire products in quantities of more than 2,500 lbs. shall be governed by the price provisions of this Schedule.

✦ ✦ ✦

### WPB Curtails Manufacture of Non-Essential Incandescent Lamps

SEEKING to save large quantities of nickel, brass and copper, the War Production Board has ordered sharp curtailment in the use of these critical materials for manufacture of non-essential incandescent lamps.

✦ ✦ ✦

ESTIMATES obtained by the Electrical Appliances and Consumers' Durable Goods Branch showed that use of nickel wire in incandescent lamps rose from 396,684 pounds in 1940 to 523,622 pounds last year, brass increased from 14,590,800 pounds to 19,259,856, and copper from 623,160 to 822,571. Use of other materials increased correspondingly.

✦ ✦ ✦

THE curtailment program is designed to save at least 221,000 pounds of nickel, 2,874,000 pounds of brass and 295,000 pounds of copper this year. Substitution of less critical materials will increase the savings.

✦ ✦ ✦

THE industry is comprised of 28 companies, and employs approximately 21,000 persons. It is well suited for war work, and has been engaged on substantial Army and Navy contracts.

✦ ✦ ✦

### Artillery Shells From Brass Saved In Shoe Eyelets

ENOUGH brass to make a million artillery shell cases a year will be saved by using substitutes for brass in shoe eyelets, manufacturers have agreed they can use japanned metal instead of brass with no loss in wear, it was explained.

### Stitching and Bookbinder's Wire Gets A-8 Material Rating

AN A-8 preference rating has been made available by the War Production Board for delivery of materials for the manufacture of stitching and bookbinders wire, essential to the printing and publishing industry.

✦ ✦ ✦

PRODUCERS are entitled to apply the rating to obtain delivery of the steel rods necessary to make stitching wire. The rating can be applied only for materials authorized on Form PD-82. WPB will determine these requirements on a quarterly basis, and it is expected that for the first quarter, a reduction of from 10 to 12 per cent from normal current usage of steel will be required.

✦ ✦ ✦

RESTRICTIONS on use of steel in succeeding quarters may be greater because of the increasing military demands, WPB, therefore, urges every graphic arts establishment using stitching wire, to study its consumption and make every effort to conserve the sup-


# THE WATSON MACHINE COMPANY

ESTABLISHED 1845

PATERSON, NEW JERSEY, U. S. A.

ELECTRICAL WIRE AND CABLE AND WIRE ROPE MACHINERY

Stranders
Bunchers
Cablers
Closers
Armor. Machines
Tapers
Juters
Serving Heads
Compound Tanks
Saturating Tanks
Powderers and Chalkers
Capstan Sections

Let-offs
Gang-Spoolers
Re-winders
Capstan Takeups
Continuous Takeups
Heavy-Duty Takeups
Traverses
Measuring Mach's.
Testing Mach's.
Vulcanizers
Polishers
Reel Crutches

MEAS. MACH'S. TRAVERSES, REEL CRUTCHES, BUNCHERS, SMALL POWDERERS, ETC. — USUALLY CARRIED IN STOCK

LITERATURE AVAILABLE ON ALL LISTED UNITS

ply, reduce waste and eliminate non-essential uses.

✦ ✦ ✦

THE preference rating, applying only to round or flat steel wire used in the binding processes employed in the printing, publishing and related service industries, was assigned under Preference Rating Order P-101.

✦ ✦ ✦

### Defense Limits Pin Production

MILITARY demand for iron and steel products is so great that "even production of the common pin for civilian use is being curtailed," it was recently reported.

✦ ✦ ✦

"SUCH items as wire clips, book wire, staples, tag wire, and numerous specialties all are affected in one way or another by the pressure of military and naval requirements," the release added.

✦ ✦ ✦

"SOME indication of the demand for small steel wire products for the navy alone is furnished by one inquiry closing Jan. 30, including: 202,000 steel wire desk baskets, 515,000 bull dog paper clips, 3,285,000 boxes of wire paper clips, 168,000 boxes of brass paper fasteners, 405,000 boxes of flexible paper fasteners . . . and 752,000 dozen steel thumb tacks."

✦ ✦ ✦

### Allocation of Bullet Core Steel Ordered

A COMPLETE allocation system for shot and bullet core steel is set up in Order M-21-f.

✦ ✦ ✦

THE order applied to steel for 20, 37, 40, 57 and 75 millimeter and three-inch armor piercing and semi-armor piercing shot, and to .30 and .50 caliber bullet cores.

✦ ✦ ✦

IT provides that starting March 1st no deliveries of shot and bullet core steel shall be made except on an allocation order.

✦ ✦ ✦

### Primary Iron & Steel Products

UNDER Section 1306.9 (c) Products included in the Definition of iron and steel products—the Government has classified the following as primary wire and wire products for manufacturing purposes.

**Wire and wire rods—all types and grades**
**Merchant wire products, including:**
- **Nails, staples, and brads**
- **Merchant quality wire**
- **Wire fencing, including woven, chain link and lawn**
- **Bale ties and buckle wire**
- **Posts—all types and accessories**
- **Poultry and animal farm netting**
- **Twisted barbless and barbed wire**
- **Wire clothes line**
- **Wire rope, wire strand, and special cords such as aircraft**
- **Woven wire cloth—insect, hardware, and all other**
- **Wire belting**
- **Wire hoops**
- **Communication and power transmission wire**
- **Welded or woven wire fabrics for reinforcing**

✦ ✦ ✦

### Sub-Contracting Exhibits

FOURTEEN permanent sub-contracting exhibits are now in operation in industrial centers of the nation or will be set up within a few days. The purpose of these exhibits is to show small

(*Please turn to Page 170*)


**No Wire Machine can be Better than its DIES!**

**It's the *DIE* that controls QUANTITY—ACCURACY —QUALITY OF FINISH —PHYSICAL PROPERTIES**

After you've spent thousands of dollars to get the best wire drawing machines – don't handicap them by using anything but the best tungsten carbide dies.

Get the most out of your machines—in speed, in accuracy, in volume, in uninterrupted high quality production—by using TECO CARBIDE DIES. Made of uniform, dense, hard Tungsten Carbide . . . TECO CARBIDE DIES provide the increased quality and quantity of production so vitally needed to meet today's War demands.

Tungsten Electric Corporation manufactures wire and bar dies, tubing dies, extruding dies, sizing dies . . . also carbide blanks, tools, bits and special tools. Write or telephone to have one of our engineers discuss your requirements.

**TECO**
**CARBIDE DIES**

**TUNGSTEN ELECTRIC CORPORATION**
564 39th Street • • • Union City, N. J.
Branch Office: 2906 Euclid Avenue, Cleveland, Ohio
*Pioneers in Tungsten Carbides for Over a Quarter Century*

# A Review of Recent Wire Patents

No. 2,268,617, METHOD OF MAKING COPPER CLAD WIRE, patented January 6, 1942 by Robert C. Pierce, Niles, Mich., assignor to National-Standard Company, a corporation of Michigan.

The method comprises electro-coating with a thick layer of adherent copper, a high tensile strength steel wire of predetermined initial thickness greatly in excess of the predetermined final thickness desired, to produce a uniform, porous, electro-conductive, copper layer having a matte surface and having a thickness markedly in excess of the desired conducting layer, and then drawing the so-coated wire in a series of several passes through dies of progressively decreasing cross section to produce a high tensile strength steel core of the predetermined cross section, and altering in such drawing the porous matte copper to a hard, continuous, electro-conductive coating, the coating having strength and adherence characteristics sufficient to withstand acute bending without fracturing.

✦ ✦ ✦

No. 2,268,704, ELECTRIC CABLE, patented January 6, 1942 by Luigi Emanueli, Milan, Italy, assignor to Societa Italiana Pirelli, Milan, Italy.

Insulation material for the wire conductor is oil made up of hydrocarbons which generate gas by chemical action under the influence of the electric field due to the cable potential, whenever the inside fluid pressure drops below that at which any gas present ionizes under the applied potential, which generation of gas continues at least until the pressure rises to a point sufficiently high to substantially prevent further ionization.

**Complete Descriptions and Drawings of Patents May Be Had for 25 cents. Address, Wire & Wire Products, 300 Main St., Stamford, Conn.**

✦ ✦ ✦

No. 2,269,150, WIRE COATING DEVICE, patented January 6, 1942 by Edward J. Flynn, Schenectady, N. Y., assignor to General Electric Company, a corporation of New York.

This device includes a reservoir for coating material, and a grooved roller closing in part an opening in the reservoir and dipping into the material so that the material may be conveyed to the wire.

✦ ✦ ✦

No. 2,269,230, ELECTRICAL CABLE, patented January 6, 1942 by Manuel H. Savage, Bridgeport, and Lyman H. Hitchcock, Milford, Conn., assignors to General Electric Company, a corporation of New York.

Invention lies in the insulation for the wire conductor the same being the product of vulcanizing a rubber composition having sufficient rigidity as to maintain the conducting wire accurately centered during vulcanization in situ on the wire, the composition comprising 70 to 85% by weight of rubber, a reaction product of rubber and a halogen acid of tin, and a vulcanizing agent, this reaction product constituting not exceeding substantially 40 per cent by weight of the rubber in the composition.

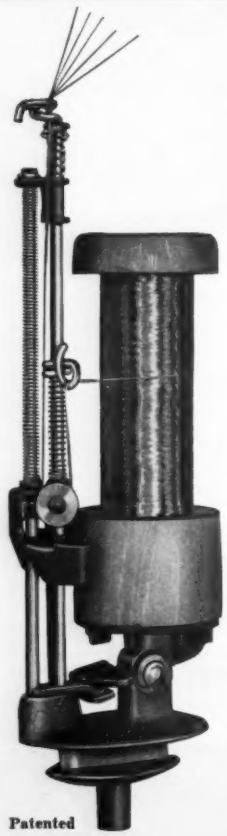
✦ ✦ ✦

No. 2,269,476, SELF - LOCKING SCREW, patented January 13, 1942 by Ougljesa Jules Poupitch, Chicago, Ill., assignor to Illinois Tool Works, Chicago, Ill., a corporation of Illinois.

The thread of the locking section has a normal outer diameter and a uniform root diameter which is greater than the maximum root diameter of the thread on the leading section of the screw.

✦ ✦ ✦

No. 2,269,601, PROCESS FOR THE MANUFACTURE OF ARTICLES RESISTANT TO GASEOUS CORROSION, patented January 13, 1942 by Rene Perrin, Paris, France, assignor to Societe d'Electrochimie d'Electro-Metallurgie et

Patented
2 BX - Special
MOSSPEED Carrier.

MOSSPEED BRAIDER CARRIERS
FOR BRAIDING
MULTIPLE ENDS OF FINE WIRES

A special design MOSSPEED CARRIER and BOBBIN is supplied for braiding "SHIELDED" WIRE & ETC.

Will braid multiple ends of fine aluminum, brass, bronze or copper wire, Etc.

SHEAVE-WHEEL on braider-stop and SPECIAL-THREADEYES on carrier, together with new type BOBBIN provides an even wire "let-off" resulting in a high quality and uniform braided shield.

Consult our engineers regarding your braiding problems.

**MOSSBERG**
**Pressed Steel Corp.**
18 West Street
Attleboro, Massachusetts, U. S. A.
European Agent
James Day (Machinery), Ltd., The Grange, Whetstone, Nr. Leicester, England
Ross Whitehead & Co., Ltd., Montreal and Toronto, Canada.

des Acieries Electriques d'Ugine, Paris, France, a corporation of France.

A metal is alloyed with an alloying element which combines at high temperatures with the gaseous substance to form a corrosion-resistant compound having a dissociation pressure lower than that of the compounds of the base metal with this gaseous substance which are formed under the same heating conditions, and subjecting the alloyed metal to a heating pretreatment in an atmosphere containing the gaseous substance at a partial pressure above the dissociation pressure of the compound of the gaseous substance and the alloying element but below that at which the corresponding compound of the base metal forms in amount to materially impair the effectiveness of the coating wanted.

✦ ✦ ✦

No. 2,269,869, WOVEN WIRE BELT FOR PAPERMAKING MACHINES, patented January 13, 1942 by Harry G. Specht, Montclair, N. J., assignor to Eastwood-Nealley Corporation, Belleville, N. J., a corporation of New Jersey.

Knuckles are produced in both the warp and shute wires, the shute wires having spaced reed marks at their undersides, the warp wires being arranged in pairs and interwoven with the shute wires with each pair disposed between two adjacent reed marks of each of the shute wires and the warp wires being individually interwoven with the shute wires in twill weave arrangement in which the warp wires each extend over one and under a plurality of shute wires in the warp direction of the fabric.

**For Information Regarding The Wire Association Address**

**Richard E. Brown, Secretary**
**300 Main Street, Stamford, Conn.**

No. 2,271,111, METHOD OF MANUFACTURING SPRINGS, patented January 27, 1942 by Cal W. Wulff, Chicago, Ill., assignor to Holland Company, a corporation of Illinois.

A steel bar or the like is heated to a predetermined temperature suitable for coiling and above its critical temperature, then coiling the bar about a mandrel, immediately thereafter removing the coiled bar from the mandrel and before any portion of the bar cools below its critical temperature, reheating the same to a predetermined quenching temperature, and then immediately thereafter quenching the coiled bar in a medium of low viscosity and high volatilization until the temperature of the bar is lowered to around 400°F. and then tempering the coiled bar.

✦ ✦ ✦

No. 2,271,233, INSULATED ELECTRICAL CONDUCTOR, patented January 27, 1942 by Henry A. Smith and Edward H. Jackson, Fort Wayne, Ind., assignors to General Electric Company, a corporation of New York.

Wire enamel is provided comprising a solution of a superpolyamide having therewith a compatible heat-hardenable, alkaline-catalyzed phenol-aldehyde resin.

No. 2,271,242, METHOD OF NON-AGING STEEL, patented January 27, 1942 by Clarence L. Altenburger, Dearborn, Mich., assignor to Great Lakes Steel Corporation, Ecorse, Mich., a corporation of Delaware.

This method comprises placing the ferrous material in a furnace, displacing the gas in the furnace with a gas having as the active constituent thereof substantially only hydrogen, causing the material in the furnace to be heated to a temperature sufficient to effect the usual desired annealing thereof, and removing from the hydrogen any amounts of nitrogen absorbed thereby from the material in excess of those amounts present when the nitrogen content of the material is in excess of 0.002%.

✦ ✦ ✦

No. 2,271,375, PROCESS OF COATING METAL SURFACES, patented January 27, 1942 by Cecil J. MacKay, Montreal, Quebec, Canada, assignor to Rust Proofing Company of Canada, Limited, Montreal, Canada, a corporation of Canada.

A process is provided for treating articles of iron, copper, and alloys of each of them, and includes fusing together manganese dioxide and a mixture of alkali metal compounds including alkali metal hydroxide and alkali metal carbonate, the resulting mass being in the molten state reactive with the metal treated to produce a surface coating thereon, and subjecting the articles to the action of the molten mass.


# A plain statement of facts

Syncro's outstanding research achievements have given Syncro machines many important advantages.

Such developments as Syncro Magnetic Slip Clutches, Syncro Expanding Arbors, Syncro Variable Speed Rod-blocks, Syncro High Speed Steel Wire Drawing Machines and a host of other new or improved devices definitely assure Syncro superiority.

To obtain the ultimate in productive capacity, economy and efficiency, consult the Syncro Machine Company.

**SYNCRO MACHINE COMPANY** RAHWAY, NEW JERSEY McCORMICK BLDG., CHICAGO

REPRESENTED IN CANADA BY CANADIAN ELEVATOR EQUIPMENT CO. LTD., TORONTO

*Machinery for the Wire Industry*

SYNCRO

## And That's How Barbed Wire Started and Grew

(*Continued from Page 150*)

it. In the winter, the only time that the men had to work with the wire at first, about forty feet could be made at a time. But later in the summer, when they commercialized it, hundred foot strands of wire were made.

✦ ✦ ✦

THEN in 1874 Glidden and Ellwood, neighboring farmers, went into a partnership, and the result was the "Barbed Wire Company." When the two men had consolidated, they immediately tried to make sales in their own and other states. Although they met difficulties in some parts of the country selling their wire, they found the sale of their product brisk from the very beginning.

✦ ✦ ✦

BUT not always were sales easy to introduce, and farmers were more skeptical than cattlemen. Demonstrations by way of public gatherings had to be held, and low prices were offered. And to make matters worse, often it wasn't a matter of not wanting to go to all the expense of putting wire up or a lack of knowing how to handle the wire; it was a matter of not wanting the fence torn down after one had gone to the expense of having put it up. By the time the wire had reached Texas in large amounts, the wire-cutters had already gone to work with their snippers. Some men had had their fences taken down to keep them from being torn down, and these men did not always vent their wrath on the wire-cutters. A Coleman County, Texas, farmer, J. L. Vaughn, wished that the "man who had invented barbed wire had it all wound around him in a ball and the ball rolled into hell." Many men, as Vaughn, thought that barbed wire was forced upon them, and surely they did not wish to put up fences when it cost them so dearly.

✦ ✦ ✦

THE larger cattlemen started fencing first because only they could afford it. Instead of cattlemen, they became cattle kings. Smaller cattlemen who could not afford fencing at first grouped themselves together and opposed the "big-pasture" men. Between these groups the six-gun played prominently.

✦ ✦ ✦

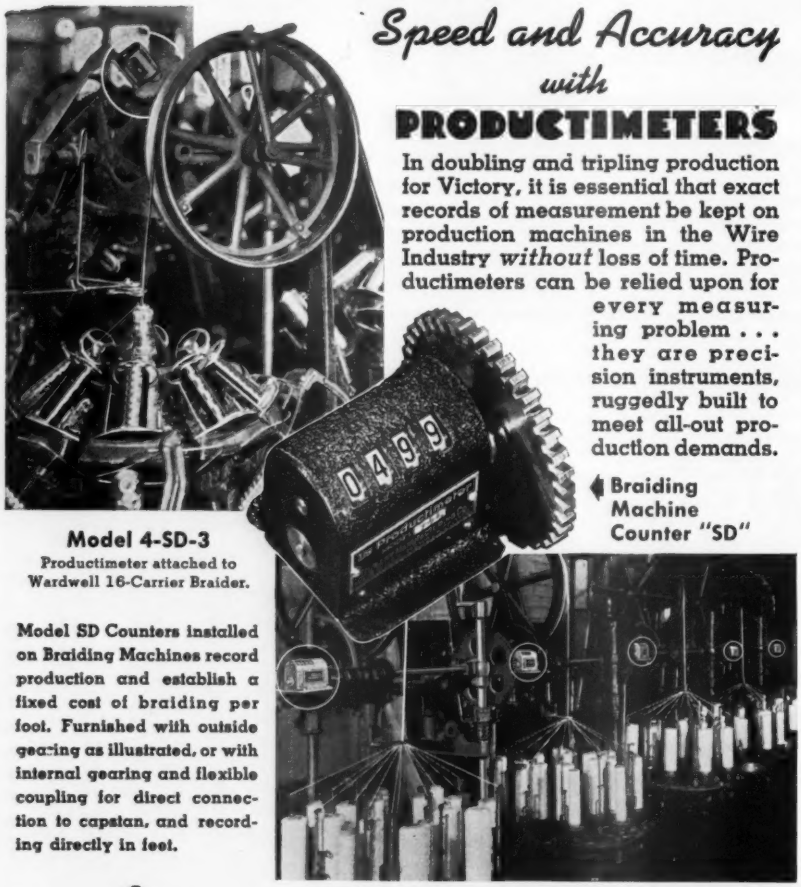
IN Texas, fence-cutting reached its height in 1884, and Governor Ireland called a special session of the state legislature to pass a law prohibiting the evil of fence-cutting. The law provided that big-pasture men must provide gates in their fences every three miles; fence-men were forbidden to fence in "nesters"; persons caught cutting fences were to serve penitentiary sentences.

✦ ✦ ✦

ON November 13, 1893, the young county judge of Uvalde County, **John Nance Garner,** sent for Rangers to assist in checking fence-cutting in that county.

✦ ✦ ✦

THEN barbed wire went to all sections of the nation and world; it serves cattleman, farmer, soldier. Today it is impossible to escape this type of fencing.


*Speed and Accuracy with*
**PRODUCTIMETERS**

**In doubling and tripling production for Victory, it is essential that exact records of measurement be kept on production machines in the Wire Industry *without* loss of time. Productimeters can be relied upon for every measuring problem . . . they are precision instruments, ruggedly built to meet all-out production demands.**

**Braiding Machine Counter "SD"**

**Model 4-SD-3**
Productimeter attached to Wardwell 16-Carrier Braider.

**Model SD Counters installed on Braiding Machines record production and establish a fixed cost of braiding per foot. Furnished with outside gearing as illustrated, or with internal gearing and flexible coupling for direct connection to capstan, and recording directly in feet.**



**Model 4-SD-3 on New England Butt Braiders**

**Durant offers a very complete line of Wire Measuring Units with models for bare cable, insulated wire, rough-surfaced conductors, armored cable, chain, and for oily, greasy materials. Capacities from 0" to 3½" diameter . . . Speeds from 600 to 5000 counts per minute. Write our Engineering Department about your measuring problems, today!**

***Wire Measuring Catalog No. 3 sent on request.***

**DURANT MANUFACTURING COMPANY**
**1918 N. Buffum St., Milwaukee, Wis. 176 Eddy St., Providence, R. I.**
PRODUCTIMETERS
THE SPEEDOMETERS OF INDUSTRY

The country in places is beautified partly because of it. It breaks the monotony of flatness in some places. The quickest way to get through thickets in some places is to follow the fenceline. The resident of the city may be hardly aware of the importance of the fence. In fact, he is hardly aware of the fence itself. But he cannot travel far from the city without seeing it. And the fact that barbed wire fence is one of the most important factors in the life of the United States can never fully escape anyone.

✦ ✦ ✦

## A.S.T.M. Specifications for Wire And Cable

INCLUDED in the new A.S.T.M. Standard on Copper and Copper Alloys twelve specifications cover various types of wire and cable for electrical conductors. Eight give important requirements for various types of nonferrous metals such as electrolytic copper, fire-refined copper, slab zinc, pig lead, nickel, lead-coated copper sheets, and a proposed draft covering oxygen-free electrolytic copper wire bars, billets, and cakes.

✦ ✦ ✦

SIXTEEN standards cover various types of plates, sheets, and strip, including cartridge brass, gilding metal, gilding metal bullet jacket cups, bridge bearing and expansion plates, phosphor bronze, beryllium-copper material and muntz metal.

✦ ✦ ✦

THE field of wire rods, bars and shapes (not electrical conductors) is covered by 15 specifications. There are nine for various types of pipe and tubes—copper and brass boiler tubes, standard pipe, copper seamless tubes and water tubes. The 16 specifications for copper, base alloys for sand castings include the important classifications of cast copper base alloys.

✦ ✦ ✦

COPIES of the 350-page publication in heavy paper cover can be obtained from the American Society for Testing Materials, 260 South Broad street, Philadelphia.

## American Steel & Wire Revises Galvanized Barbed Wire Types

IN the interests of conservation of materials and simplification of product, American Steel & Wire Co. has revised its galvanized barbed wire types. In the future all two-point barbed wire is to have a uniform spacing of four inches between barbs and all four-point barbed wire a uniform spacing of 5 inches between barbs. After present stocks are sold out there will, therefore, be no differentiation between the former "hog" and "cattle" wire, and only one style spacing instead of two in each brand or style will be available.

✦ ✦ ✦

THE revised spacing of barbs will serve satisfactorily all purposes for which barbed wire is designed and at the same time reduce the number of styles of barbed wire jobbers and dealers must stock to serve their trade properly. Six styles will now be produced instead of twelve.

WHEN YOUR REPUTATION HANGS BY A WIRE-
be sure it's Callite!
Performance requirements and production speeds are growing steadily tougher to meet. Smart wire buyers specify Callite because of its dependable uniformity. Callite standards guarantee accuracy in composition, size, temper and finish... in sizes as small as .002". If stymied by unfamiliar problems, save precious time by calling in Callite technicians, particularly if your problem involves fine precision wires of special alloys.
CALLITE FINE WIRES
are furnished in these metals and alloys
ALUMINUM
STAINLESS STEEL
SILVER
BERYLLIUM-COPPER
NICKEL ALLOYS
MONEL
PHOSPHOR-BRONZE
BRUSH WIRE
TUNGSTEN
NICKEL SILVER ALLOYS
SPECIAL ALLOYS
MOLYBDENUM
COMMERCIAL BRONZE
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CALLITE TUNGSTEN CORPORATION
564 39TH STREET • UNION CITY, NEW JERSEY
branch offices: Chicago, Ill. — Cleveland, O.
A FINE WIRE FOR EVERY NEED
CALLITE TUNGSTEN
CT

## Subcontracting for Defense

### A Study Prepared in the Interest of Stabilizing Employment

PRODUCTION is a vital problem today. Any information which contributes to increased efficiency will be welcomed by every company at present handling defense work; more than welcome to manufacturers who want to obtain defense contracts. **SUBCONTRACTING FOR DEFENSE: A Study Prepared in the Interest of Stabilizing Employment,** a report just issued by the Policyholders Service Bureau of the Metropolitan Life Insurance Company, contains such information. This study outlines the methods followed by 28 companies that have been outstandingly successful in meeting the problems of prime contracting or subcontracting. It includes a section on obtaining prime contracts for various types of supplies and equipment required by the Government; describes sources of information on governmental requirements and on procurement setup and procedure. It discusses the administration of and responsibility for subcontracting in the prime contractor's organization, and steps commonly followed in selecting and scheduling work to be farmed out. The report also shows a variety of sources which primary contractors use to locate and contact subcontractors, and methods adopted for appraising their facilities and skill.

✦ ✦ ✦

THE procedure followed in obtaining a subcontract is thoroughly covered in the report by a presentation of details of the methods used by successful subcontractors. Some of the other points covered are: the assistance typically given by the prime contractor to the subcontractor, production control procedures for both the prime contractor and the subcontractor, and the basis for pricing subcontract work. The study includes a number of practical charts and diagrams illustrating methods and procedures successfully used by contributors to the survey.

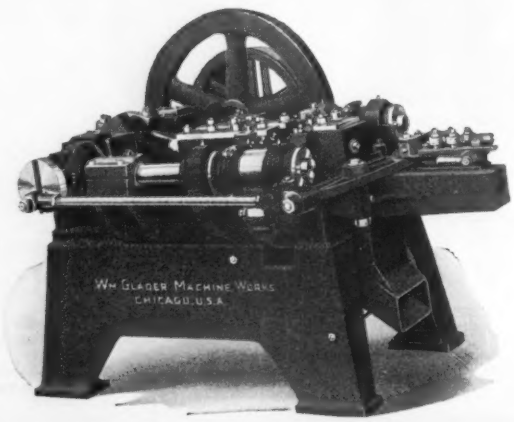
A COPY of this report is available to executives who request it on their business stationery. Address: Policyholders Service Bureau, Metropolitan Life Insurance Company, One Madison Avenue, New York City.

✦ ✦ ✦

## Platinum Metals Industry for 1941

IN reviewing the Platinum Metals Industry for 1941, **Charles Engelhard,** President of Baker & Co., Inc., stated that glass wool fiber for insulation and other similar purposes is made from molten glass which is passed through small orifices in platinum metal alloy feeder dies. These alloys are used because of their resistance to oxidation, abrasion and chemical corrosion. Platinum alloys also perform a most important function in producing rayon fiber. The viscous solution is extruded under pressure into an acid bath through platinum metal alloy spinnerettes having very small holes that must retain their contours and dimensions despite severe corrosive action.


# GLADER WIRE NAIL MACHINE SCORES AGAIN




**WM. GLADER MACHINE WORKS**

210 N. Racine Ave. Chicago, Illinois

A new Wire Mill under construction in the State of Texas will install GLADER WIRE NAIL machines 100%.

The production figures on common nails shown below, are guaranteed.

| SIZE MACH. | SIZE WIRE | MAX. LENGTH OF WIRE | NUMBER OF NAILS PER MIN. | CAP. IN POUNDS PER HR. |
|---|---|---|---|---|
| #00A | #16 | 1⅛" | 700 | 37.2 |
| #00 | #14 | 1¼" | 550 | 55 |
| #0 | #12 | 1¾" | 450 | 89 |
| #1 | #10 | 2½" | 400 | 192 |
| #2 | #8 | 3½" | 325 | 310 |
| #3 | #4 | 5" | 225 | 523 |
| #4 | #1 | 7" | 190 | 622 |
| #4s | 5/16" | 9" | 175 | 1155 |
| #5 | ⅜" | 12" | 160 | 2400 |

This high output and economical operation account for the GLADER machine being accepted as standard equipment in all recent installations.

### Motor-Driven Type H Switch

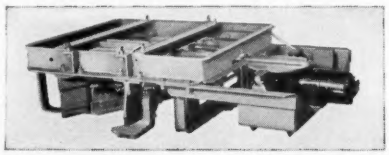
A NEW electrically operated track switch known as a Motor-driven Type H Switch has been developed by the Cleveland Tramrail Division of The Cleveland Crane & Engineering Co., Wickliffe, Ohio, for use on cab-operated, gravity, or automatic dispatch overhead materials handling systems.

✦ ✦ ✦

THIS development enables the Tramrail operator to pre-set the switch at some distance ahead while traveling and thus save time lost when switching by hand. Likewise, indexes on gravity or automatic dispatch carriers may be set to actuate trippers which will cause one or several switches to take the positions desired.

✦ ✦ ✦

THE switch is ruggedly built of steel welded. It consists of two main assemblies — an outer supporting frame and an inner sliding frame. The outer frame is designed for bolting rigidly to the



super-structure. The inner assembly carrying a straight and a curved rail, rides on multiple easy-operating rollers, and is set in position by a motor-driven cam through a lever arrangement.

✦ ✦ ✦

SYSTEMS employing Cleveland Tramrail motor-driven track switches can be furnished to suit nearly every materials handling requirement.

✦ ✦ ✦

### B. L. McCarthy, Speaker at Buffalo A.S.M. Meeting

B. L. McCARTHY, director of research of Wickwire Spencer Steel Company, spoke on Color Metallography at a meeting of the Buffalo Chapter of the American Society for Metals, Feb. 5th, at the Hotel Buffalo.


*Bell-Mine Pulverized Lime*

WARNER COMPANY — Lime — Bell Mine Products — BELLEFONTE DIVISION

FOR WIRE DRAWING

"Bell-Mine" Lime is free from grit
and other impurities
.....has a high guaranteed
content of Calcium
.. is unusually slow settling
in the milk of Lime Box
.. is truly economic in use.

Warner Company

BELLEFONTE DIVISION

SALES OFFICES: PITTSBURGH, PHILADELPHIA, BELLEFONTE, N. Y. CITY.



An Interesting Report on NORBIDE ABRASIVE

from a prominent die maker:

"In the drilling and ripping of large dies #220 Norbide abrasive grain has replaced the use of silicon carbide with great economy in time and expense.

"Number 320 F. Norbide abrasive grain has eliminated the use of diamond powders in the lapping and semi-polishing operations with equal success.

"In the drilling of small dies up to the point of 'breaking through' Norbide abrasive has proved even more effective than diamond powder."

NORTON COMPANY
WORCESTER, MASS.

N-52

FOR

# QUALITY AND ECONOMY

# ...SMIT DIAMOND POWDERS

- MADE FROM NEW FINE BORTZ reduced to small, sharp, uniform fragments by a careful crushing and separation process.
- NOT MADE from salvaged waste particles.
- GRADED IN SIZES from number 1 to number 6 by a particle size analyzer so that the fragment sizes are uniform and perfectly adapted to the work for which they are selected.
- FOR BETTER, FASTER WORK.

WRITE FOR FURTHER INFORMATION AND PRICE QUOTATIONS

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6400 Tireman Avenue, Detroit, Mich. — 7 South Main Street, West Hartford, Conn. — Law and Finance Bldg., Pittsburgh, Pa. — 2433 41st Avenue, North Seattle, Wash.

*To Wind and Ship Your Cable Wire—*

CLARK ALL-METAL SPOOLS. Suited to Insulated Wire, Solder, and similar products.

A spool designed for rigid and permanent assembly in your plant; Ends and Traverses shipped unassembled. One simple operation on a hand or power press (with assembling die which we can furnish) makes a durable winding and shipping spool. The material is cold rolled steel in gauges to meet your demands for strength. All edges curled. All parts lithographed to protect the metal and for display of your design and copy.

Made in 5", 6½", and 10½" diameter Ends; Traverses in 1 15/16" diameter (or special 3½" diameter for 10½" End), in any desired length.

*We will gladly send samples and prices at your request.*

★

J. L. CLARK MANUFACTURING CO.

600 23rd Avenue, ROCKFORD, ILLINOIS ★ 901 Chrysler Building, NEW YORK, NEW YORK

## New Convertible Acid Pump

A NEW series of corrosion-resisting pumps in which it is possible to get 480 combinations of alloys, types and sizes with heads and capacities to meet practically any requirement was displayed at the recent Exposition of Chemical Industries by The Duriron Company, Inc., of Dayton, Ohio.

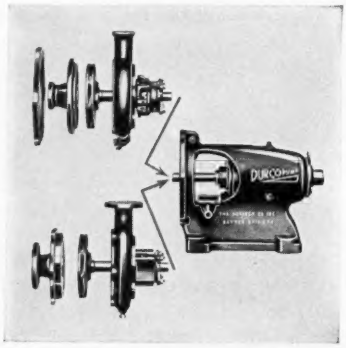
✦ ✦ ✦

THEY have a convertible feature said to be exclusive to these pumps. "Durcopumps" that are made in the high-silicon irons, Duriron and Durichlor, can be converted to stainless steel pumps by substituting the wet-end parts, and can be made without disturbing the setting of the pump.

✦ ✦ ✦

THIS is said to be especially valuable where there are to be changes in the liquids handled. For instance; a Durcopump for unloading acid tank cars can be converted to stainless steel to pump caustics.

✦ ✦ ✦



BULLETIN No. 810-W illustrates and describes these pumps in detail, with complete dimensions for all sizes. You are invited to write for a copy, mentioning this publication.

✦ ✦ ✦

## W. A. Laidlaw Wire Co. Organized in Pittsburgh

THE W. A. Laidlaw Wire Company was recently organized and incorporated in Pittsburgh under the laws of Pennsylvania. Officers are **Victor J. Mueller, John B. Mueller** and **Richard L. Post.** The firm will manufacture, buy, sell and deal in steel and metal products.

## Outstanding Personalities of the Wire Industry

(*Continued from Page 151*)

### F. J. Carr, Vice President, Finance, American Steel & Wire Company

FRANK J. CARR has been elected vice-president, finance, of American Steel & Wire Co., subsidiary of U. S. Steel Corp.

✦ ✦ ✦

MR. CARR was born in Batavia, Ill., on April 26, 1892. He attended public schools there and in nearby Aurora, Ill., before going to the Wharton School of Finance at the University of Pennsylvania, where he was graduated in 1915 with a degree of B. S. in Economics.

✦ ✦ ✦

AT the same time, **C. S. Morris** was appointed supervisor of accounting and **Ogden Ashley** made assistant to Mr. Carr.

✦ ✦ ✦

MR. CARR'S association with American Steel & Wire began in March, 1938, when he was appointed to the post of assistant to the president. The following October he was named comptroller of the company.

✦ ✦ ✦

PRIOR to becoming associated with American Steel & Wire, Mr. Carr served for four years as comptroller of the Tennessee Valley Authority at Knoxville, Tenn. Previous to that he had been comptroller of Aviation Corporation. During the first World War he was a Lieutenant in the Ordnance Department of the U. S. Army.

MR. MORRIS has been associated with the Wire Company since October, 1907.

✦ ✦ ✦

MR. ASHLEY started with the company in May, 1941, as assistant to the comptroller, which post he has held to the present time.

✦ ✦ ✦

### T. D. Hudson, Asst. to Pur. Agt., American Steel & Wire Company

T. D. HUDSON, formerly purchasing agent and assistant auditor of the Pittsburgh-Conneaut Dock Co., Conneaut, Ohio, joined the purchasing staff of the American Steel & Wire Co. the first of February as assistant to **Frank E. Chesney**, purchasing agent for the latter firm.

✦ ✦ ✦

BORN in Pittsburgh, Pa., Mr. Hudson began working for the Pittsburgh-Conneaut Dock Co. in that city 26 years ago and after being transferred to Conneaut became a director of both that com-

(*Please turn to Page 166*)

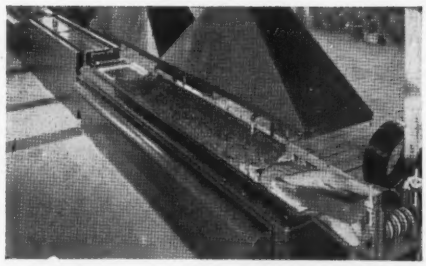

# NEW — OUTSTANDING!

## The *Trauwood* PROCESS

## TEMPERING—PATENTING—ANNEALING

**Steel Mill installations for wire and strip have proved these advantages:**

- **Faster Speeds — Greater Production**
- **Better and More Uniform Physical Properties**
- **No Decarburization—Practically No Scale**
- **Extremely Accurate Control of Heating and Cooling Rates**
- **Exceptionally High Thermal Efficiency**
- **Overall Low Cost Operation**



Trauwood Electric Wire Tempering and Patenting Unit

**Complete Details of the Trauwood Process Will Be Furnished You On Request. Our Engineers Are At Your Service. Write Today.**

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## "STANDARD" WIRE MILL EQUIPMENT

**TURKS HEADS**

Adjustable draw plates—accepted by wire trade as accurate efficient means of producing rectangular and special shapes. Available with friction or power driven rolls. Catalog TH.

**DRAW BENCHES**

8 sizes, 2 general types. Machines are of one-man type with all controls at die end. Catalog DB.

**ROLLING MILLS—STRIP AND WIRE**

Roller bearing and plain bearing mills; many regular sizes or made to suit user's specific needs. Write fully.

**SWAGING MACHINES**

For reducing diameter of tubular and solid bar stock into cylindrical, conical, or "necked" shapes. Capacities from ½" tube, ¼" solid to 6" tube or 3¾" solid. Catalog SM.

**ALSO**

Hand Screw, Foot, and Power Presses; Drop Hammers, and Scrap Bundlers.

✓ your needs for this equipment and write for catalogs.

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MACHINES

FOR THE WIRE INDUSTRY

for BUNCHING • BRAIDING • CABLING • COILING • CLOSING • MEASURING • STRANDING • TWISTING

A complete line of standard machines; also special machines designed or built to order. Let us know your requirements.

NEW ENGLAND BUTT COMPANY

PROVIDENCE, R. I.

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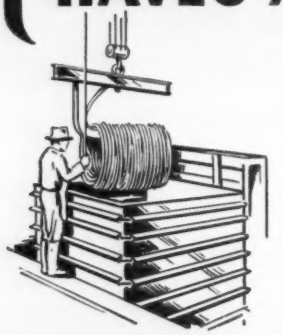
HAVEG *Pickling* TANKS



for rod, wire and strip will cut your pickling costs. HAVEG tanks are molded from Acid-washed asbestos and synthetic resin, producing a material that is tough, durable, heat resistant, and acid resistant throughout its entire mass. Acid losses stop, maintenance costs go down, production goes up, and uniformity is maintained when HAVEG, seamless, one piece, tanks are installed.

HAVEG Tanks, Towers, Piping, Fume Duct and Special Equipment are available in a wide range of standard sizes . . . completely described in bulletin F29. Send for your copy today.

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Applied Physical Metallurgy — Industrial Processing of Ferrous and Nonferrous Metals and Alloys

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Here is the book you've long wanted — a simple yet complete treatise on practical metallurgy.

WIRE & WIRE PRODUCTS

300 Main Street Stamford. Conn.


## Outstanding Personalities of the Wire Industry

(*Continued from Page 165*)

pany and the Pennsylvania-Lake Erie Dock Co.

✦ ✦ ✦

## Jones & Laughlin Announces Changes in Sales Personnel

CHANGES involving its district sales offices in New York City, Washington, D. C., Chicago, Ill., Memphis, Tenn., and the creation of a new district office in Tulsa, Okla., have been announced by the Jones & Laughlin Steel Corporation, Pittsburgh.

✦ ✦ ✦

JOHN B. DeWOLF, formerly district sales manager in New York and two years prior to that district sales manager at Philadelphia, has been appointed district sales manager in Washington, D. C. ✦ ✦ ✦

S. A. FULLER has been transferred to New York having formerly been district sales manager in Chicago and prior to that had been district sales manager in Boston from 1929 until 1938.

ERNEST W. HARWELL has been appointed district sales manager in Chicago. He has been district sales manager at Memphis, Tenn., since 1934.

✦ ✦ ✦

E. E. HOEHLE has been appointed district sales manager at Memphis.

✦ ✦ ✦

R. J. WOODS, JR., has been appointed district sales manager of the newly created district sales office at Tulsa, Okla.

✦ ✦ ✦

## Aeronautical Application of Instrument Springs

(*Continued from Page 141*)

part of the load upon the spring, the creep characteristics of the instrument may be improved. In designing concentric compression spring combinations to be used in connection with bellows, the springs are designed to take the greater part of the load and the combination is calculated to give enough plus thermal elasticity coefficient to offset a minus thermal elasticity coefficient of the bellows.

✦ ✦ ✦

THAT which applies to bellows and bourdon tubes is true also to a degree in the case of instruments in which diaphragms are used.


STEEL WIRE

By MAURICE BONZEL

✦ ✦ ✦

Translated and Published by

Kenneth B. Lewis

Consulting Engineer

✦ ✦ ✦

Price $15.00

✦ ✦ ✦

495 pages—414 illustrations

✦ ✦ ✦

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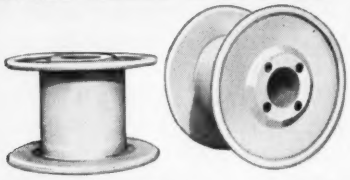
WIRE and WIRE PRODUCTS

300 Main St. Stamford, Conn.

APCO MOSSBERG
STEEL REELS & SPOOLS



For The Copper, Steel, & Wire Rope Industry

Apco Mossberg Steel Reels are standard equipment in the wire industry—and for good reason! Apco Mossberg—the original Frank Mossberg Co.—**originated** the steel reel idea and have been training workmen in their manufacture ever since. Personal attention by Apco Mossberg engineers make each job a "special".

FREE ENGINEERING SERVICE

*We will gladly submit drawings, blueprints, or suggestions without obligation to you. Write for quotation today.*

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(The Original Frank Mossberg Co.)
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NEW RICHMOND
Kentucky Avenue Just Off Boardwalk
ATLANTIC CITY, N. J.
★
European Plan—
Moderate Rates
★
ALL OUTSIDE ROOMS, MOST OF WHICH HAVE OCEAN VIEW
★
AMPLE LOBBIES AND PARLORS IN A SPIRIT OF HOME-LIKE REFINEMENT
★
*Write for Literature and Rates*
William Kneller, Owner

## Substitute for Tin in Bronze Castings

SUBSTANTIAL increases in sales of PMG Hardener are reported by the American manufacturers, Phelps Dodge Copper Products Corporation, according to a statement by **Wylie Brown,** President of the corporation.

✦ ✦ ✦

PMG Hardener is used in place of tin in the production of bronze castings, some of which in the past have contained as much as ten per cent tin.

✦ ✦ ✦

THE product has been sold in the United States for a number of years, PMG bronzes being preferred to tin bronzes by some producers. With the all-out effort to conserve tin, according to Mr. Brown, the uses of this hardener are being expanded.

✦ ✦ ✦

PMG was developed by the Vickers-Armstrong company in England, and is exclusively manufactured and sold in the United States by the Phelps Dodge Copper Products Corporation.

✦ ✦ ✦

MR. BROWN declined to estimate how much tin was being saved by the expanded use of PMG, pointing out that figures in connection with war production are not being given publicity at present, but asserted the savings were "substantial and steadily increasing".

✦ ✦ ✦

## Engineering Data on Overhead Material Handling Equipment

A VERY interesting booklet entitled "Engineering and Application Data" has just been issued by the Cleveland Tramrail Division of the Cleveland Crane & Engineering Company, Wickliffe, Ohio. The booklet contains engineering data on rail design, study of stresses, types of carriers and hoists together with charts on estimating production capacities and cost and similar general information useful to operating men.

✦ ✦ ✦

A COPY of the booklet may be obtained by writing direct to the Company.

CUTS BAKING TIME, STEPS UP OUTPUT!

Here is GOOD NEWS for mills making wire for concerns working on war orders . . . a timely, helpful suggestion for any mill that wants to reduce baking time and increase output!

Coat wire rods the easy, successful Oakite way. Simply make up your coating solution with Oakite Composition No. 24, using it with or without lime according to requirements. Many production managers and superintendents report that doing this shortens baking time from 20 to 30%.

Let us HELP YOU establish the same results in your mill! Since there is no obligation, won't you write today?

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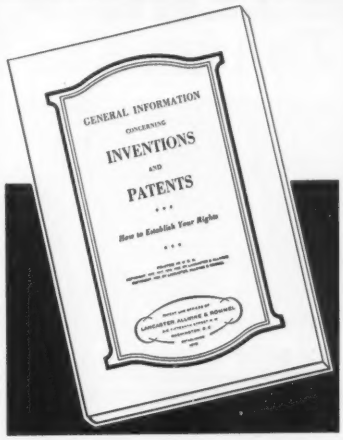
OAKITE CERTIFIED CLEANING
MATERIALS METHODS SERVICE

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WIRE MACHINES FOR

Drawing, Enameling, Tinning, Spooling, Insulating with Glass, Asbestos, Paper Tape, Cotton, etc. Multiple Pull-outs, Rubber covered wire Panners, etc.

EST. 1888 INC. 1918

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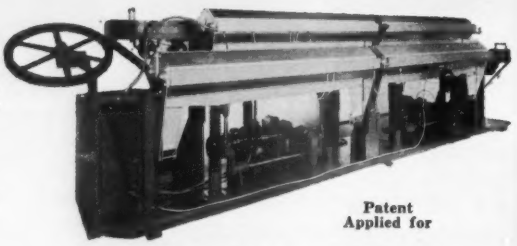

Patent Applied for

ELECTRIC BAKING OVEN
for Varnished Glass Insulated Wire
with Varnish Applicators
and Thermostatic Control.

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AUTOMATIC PRESS AND FOUR SLIDE MACHINE

FOR SWAGING, STAMPING, PIERCING, BLANKING, FORMING OF COILED METAL

WE also build machines for forming Paper Clips, Buckles, Gate Hooks, Coat and Hat Hooks, Ceiling Hooks, Wire Ears, Cable Rings, Screw Eyes, Sash Chains, Automobile Side Chains, Flat Open Link Chains, Staples, Cotter Pins, Hose Clamps, Etc., and Wire Straighteners, Wire Reels, Frame Bending Machines and Special Presses.

For Complete Details Address —

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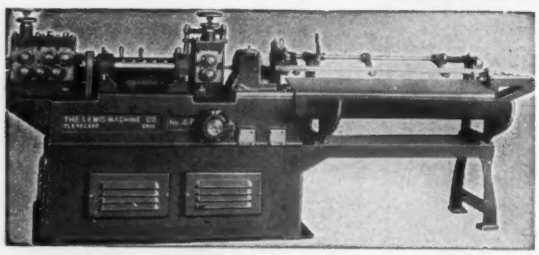
LEWIS TRAVEL-CUT WIRE STRAIGHTENING and CUTTING Machines



Machines for 1/16" to ¾" rod

Round
Square
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Hexagon

Ferrous and Non-Ferrous

Automatic
High Speed
Heavy Duty

The Sign of Dependable Service:

WE CAN SUPPLY AND ENGINEER OUR TOOLS EQUIPPED WITH CARBOLOY CEMENTED CARBIDE

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MILES AND MILES

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of Field Wire for the Signal Corps are coming from the Take-offs of ROBINSON Stranders in Defense Industries.

We are completely tooled to build stranding equipment for additional demands.

Write for information regarding our facilities for cable and rope machinery

▲ ▲ ▲

ROBINSON MANUFACTURING COMPANY

MUNCY, PA.

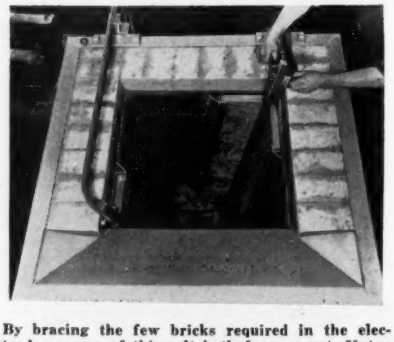
## Insulating Material Saved in New Salt Bath Pot

AN improved design change in the method of insulating pots for electric salt bath furnaces which has resulted in a decrease in the amount of bricks required, a reduction in maintenance and an increase in working space is announced by Upton Electric Furnace Div., 7450 Melville, Detroit, manufacturers of "Electrothermic-Permeation" Salt Bath Furnaces.

✦ ✦ ✦

THE new pot, illustrated, is designed for low temperatures and for such work does not require brick insulating except at the corners where the electrodes are placed. Thus, instead of lining the entire surface of the floor and walls of the pot with bricks, only the floor and the space immediately behind the electrodes requires the insulating material. To keep the bricks in position, angle iron with a bracer strip, both of which are arc welded to the walls of the pot, are used.

✦ ✦ ✦



By bracing the few bricks required in the electrode corners of this salt bath furnace pot, Upton Electric Furnace Co. saves brick insulating material, reduces maintenance costs and increases working space. Electrodes for supplying the necessary heat and easily changed by hand are shown being connected with a single bolt to the water cooled bus bar. ✦ ✦ ✦

WHEN the bricks are to be renewed, it is only necessary to slide them out at the top and replace with the new bricking in the same manner, saving the time and the material that would otherwise be required to brick the entire surface of the four walls. Moreover, with working area at a

premium in any salt bath pot, the absence of the bricks from the total wall area of the pot adds valuable working space.

✦ ✦ ✦

ANOTHER feature shown in the illustration, is the ease of handling electrodes. A single bolt connects each electrode with its respective water cooled bus bar, permitting either electrode to be changed independently of the other without mechanical means.

✦ ✦ ✦

AS the pot illustrated is to be used for an application requiring the removal of treated parts each three seconds, the sloping front on the operating side of the pot is designed to act as a drip board to reclaim some of the salt dripped from the work.

✦ ✦ ✦

### Western Electric Company's Rubber Vulcanizing Process

IN connection with the article which was published in the January Issue of WIRE & WIRE PRODUCTS entitled **"Continuous Process for Rubber Insulating Wire,"** our attention has been called to a paper presented by **Mr. S. E. Brillhart** of the Western Electric Company before the American Society of Mechanical Engineers in June, 1932, describing the continuous vulcanizing process of the Western Electric Company.

✦ ✦ ✦

THIS paper brought out that the wire insulating machines were developed by the Western Electric Company and manufactured by the National Rubber Machinery Company and we have been requested to present the following data in connection with the development of continuous rubber vulcanizing. These are:

1. **The continuous rubber vulcanizing process was developed and patented by the Western Electric Company.**
2. **A large majority of the wire manufacturers in this country, including National Electric Products Corporation, have been licensed under the Western Electric patents to use this process.**
3. **National Electric Products Corporation was licensed to manufacture the continuous vulcanizing equipment for their own use or to have it manufactured for them. They chose to have the equipment manufactured for them by the National Rubber Machinery Company.**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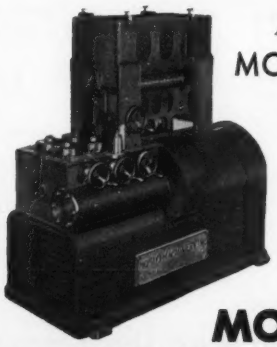

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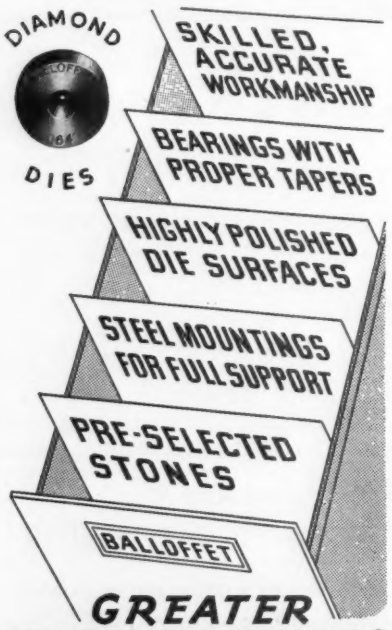


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## Government Wire Production Information

(*Continued from Page 157*)

manufacturers how they can turn their facilities to war production; and to help prime contractors and government procurement agencies find additional manufacturing facilities for war material.

✦ ✦ ✦

LOCATION of the sub-contracting exhibits already in operation or scheduled to be in operation by February 15 follow:

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**St. Louis, Mo., Boatmen's Bank Building, 420 Locust Street.**
**Philadelphia, Pa., Broad Street Station Bldg.**
**New York, New York, Chanin Building, 122 East 42nd Street.**
**Los Angeles, California, Western Pacific Bldg.**
**Cleveland, Ohio, Union Commerce Building.**
**Chicago, Illinois, Civic Opera Building.**
**Atlanta, Georgia, Mutual State Building, 5th floor.**
**New Orleans, Louisiana, Canal Building, 7th floor.**
**San Francisco, California, Whitcomb Hotel.**
**Memphis, Tennessee, Sterick Bldg., 18th floor.**
**Buffalo, New York, White Building, 4th floor.**
**Newark, New Jersey, Globe Indemnity Bldg., 20 Washington Place**
**Boston, Massachusetts, Court Street Branch, First National Bank, 17 Court Street.**

✦ ✦ ✦

## Tungsten Conservation Order M-29-b

FURTHER conservation of tungsten, vital in alloy steel, was recently ordered by J. S. Knowlson, Director of Industry Operations, with issuance of Conservation Order M-29-b.


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WIRE & WIRE PRODUCTS


THE order prohibits use of tungsten in grinding wheels, gauges, and as a coloring material for rubber, linoleum, paper or other similar materials after May 1, 1942.

✦ ✦ ✦

UNTIL that date, use of tungsten in these items is limited to 17½ per cent of the amount used during the year ended June 30, 1941.

✦ ✦ ✦

ALL other users of tungsten, except those specifically exempted, must reduce their use between February 1 and March 31 to 12 per cent of the amount used in the year ending June 30, 1941. Such users, after April 1, are limited by calendar quarters to 17½ per cent of the amount used in the base year.

✦ ✦ ✦

EXEMPTIONS to the Order include use of tungsten for Army, Navy, Lend-Lease and other Government contracts; to comply with safety regulations; orders bearing preference ratings of A-1-j or higher; corrosion-resisting material; alloy steels; hard-facing materials; hard-cutting tools and tool tips; atomic hydrogen welding rods; laboratory reagents and pharmaceuticals; laboratory research equipment; electrical equipment; radio and X-ray equipment; electromic relays and electric lighting uses, both filament and fluorescent.


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✦ ✦ ✦

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✦ ✦ ✦

## Booklet on Electroplating

THE Hanson-Van Winkle-Munning Company of Matawan, N. J., manufacturers of electroplating equipment and supplies have issued a new edition of a booklet which includes specifications for electrodeposited coatings of zinc, cadmium and nickel on steel; nickel and chromium on copper and copper base alloys; nickel and chromium on zinc and zinc base alloys; also methods of testing for local thickness of electrodeposited coatings. These are the tentative specifications of the American Sosiety for Testing Materials, prepared jointly by the American Electroplaters' Society, the National Bureau of Standards and the American Society for Testing Materials.

✦ ✦ ✦

THE booklet is bound with stiff paper covers to keep its contents, data which is indispensable to every producer of electroplated metal products, in good condition.

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Hartley, George D., Worcester, Mass.
Lewis, Kenneth B., Worcester, Mass.

**EQUIPMENT—Insulation Testing**
Davis, R. L., Electric Co., Wallingford, Conn.

**EYELETS—Brass or Zinc**
Platt Bros. & Co., The, Waterbury, Conn.

**FINISHES—Wire**
Alrose Chemical Co., Providence, R. I.

**FLASH BAKER—**
Carl-Mayer Corp., The, Cleveland, Ohio

**FLUXES—Soldering**
American Chemical Paint Co., Ambler, Pa.

**FOAM PRODUCING COMPOUNDS—**
American Chemical Paint Co., Ambler, Pa.

**FURNACES—Annealing**
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.
Trauwood Engineering Co., Cleveland, Ohio

**FURNACES—Automatic**
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

**FURNACES—Brazing**
Electric Furnace Co., Salem, Ohio
Firth-Sterling Steel Co., McKeesport, Pa.

**FURNACES—Bright Annealing**
Electric Furnace Co., Salem, Ohio
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

**FURNACES—Electric**
Electric Furnace Co., Salem, Ohio
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio
Trauwood Engineering Co., Cleveland, Ohio

**FURNACES—Hardening & Tempering**
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio
Trauwood Engineering Co., Cleveland, Ohio

**FURNACES—Lead Melting**
Electric Furnace Co., Salem, Ohio
Robertson, John, Co., Brooklyn, N. Y.

**FURNACES—Non-Oxidizing**
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio

**FURNACES—Normalizing**
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio

**FURNACES—Salt Bath**
Electric Furnace Co., Salem, Ohio
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.

**FURNACES—Wire, Strip & Sheet**
Carl-Mayer Corp., The, Cleveland, Ohio
Electric Furnace Co., Salem, Ohio
Surface Combustion, Div. of General Properties Co., Inc., Toledo, Ohio.

**GALVANIZING KETTLES—**
National Annealing Box Co., Washington, Penna.

**GRINDERS—Roll**
Norton Co., Worcester, Mass.

**HI-SPEED BAKERS—**
Carl-Mayer Corp., The, Cleveland, Ohio

**HOISTS—Electric Travelling**
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

**INHIBITORS—**
American Chemical Paint Co., Ambler, Pa.

**KETTLES—Galvanizing, Annealing, Tinning, etc.**
National Annealing Box Co., Washington, Penna.

**LATHES—Die Reaming**
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

**LIME—**
Warner Company, The, Bellefonte, Pa.

**LUBRICANTS—For Metal Cutting, Stamping and Drawing**
Miller, R. H., Co., Homer, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

**LUBRICANTS—Wire Drawing**
Miller, R. H., Co., Homer, N. Y.
Oakite Products, Inc., New York, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

**MACHINERY—Armoring (Cable, Wire Hose)**
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Robertson, John, Co., Brooklyn, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Braiding**
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Brazing**
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.

**MACHINERY—Bunching**
American Insulating Mach'y. Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Bundling, Scrap**
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Cable, Electric**
American Insulating Mach'y. Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Chain Making**
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.

**MACHINERY—Closing**
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Coil Winding**
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

**MACHINERY—Coilers**
Broden Construction Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
New England Butt Co., Providence, R. I.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Copper Wire Drawing and Rolling**
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

**MACHINERY—Covering Wire**
Fidelity Machine Co., Philadelphia, Pa.
Syncro Machine Co., Rahway, N. J.

# WHERE TO BUY, Continued

**MACHINERY—Cutting**
Broden Construction Co., Cleveland, Ohio
Lewis Machine Co., The, Cleveland, Ohio
Moslo Machinery, Inc., Cleveland, Ohio
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Shuster, F. B., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

**MACHINERY—Die Making**
Firth-Sterling Steel Co., McKeesport, Pa.

**MACHINERY—Draw Benches**
Standard Machinery Co., Providence, R. I.

**MACHINERY—Edging**
Standard Machinery Co., Providence, R. I.

**MACHINERY—Enameling**
American Insulating Mach'y. Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

**MACHINERY—Extruding**
Robertson, John, Co., Brooklyn, N. Y.
Royle, John, & Sons, Paterson, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Flat Wire**
Broden Construction Co., Cleveland, Ohio
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

**MACHINERY—Forming**
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.

**MACHINERY—Galvanizing Wire**
Broden Construction Co., Cleveland, Ohio
Sleeper & Hartley, Inc., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

**MACHINERY—Gang Winders**
Fidelity Machine Co., Philadelphia, Pa.
Robinson Mfg. Co., Muncy, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Grinding**
Norton Co., The, Worcester, Mass.

**MACHINERY—Insulating**
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Knitting**
Fidelity Machine Co., Philadelphia, Pa.

**MACHINERY—Lead Encasing Presses, etc.**
Robertson, John, Co., Brooklyn, N. Y.

**MACHINERY—Lead Stripping**
Robertson, John, Co., Brooklyn, N. Y.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Lock Washer**
Sleeper & Hartley, Inc., Worcester, Mass.

**MACHINERY—Magnet Wire**
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.

**MACHINERY—Material Handling**
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

**MACHINERY—Measuring Wire & Cable**
Davis, R. L., Electric Co., Wallingford, Conn.
Durant Mfg. Co., Milwaukee, Wis.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Nail and Tack**
Glader, Wm., Machine Works, Chicago, Ill.
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

**MACHINERY—Panning**
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

**MACHINERY—Paper Covering Wire**
Terkelsen Machine Co., Boston, Mass.

**MACHINERY—Pointing**
Broden Construction Co., Cleveland, Ohio
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Torrington Mfg. Co., The, Torrington, Conn.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

**MACHINERY—Quill Winding**
**Fidelity Machine Co., Philadelphia, Pa.**

**MACHINERY—Rod Mill**
Broden Construction Co., Cleveland, Ohio
Farrel-Birmingham Co., Inc., Ansonia, Conn.
Morgan Construction Co., Worcester, Mass.
Ruesch, H. J., Machine Co., Newark, N. J.

**MACHINERY—Rolling Mill**
Broden Construction Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

**MACHINERY—Rubber for Insulating Wire**
Royle, John, & Sons, Paterson, N. J.

**MACHINERY—Rubber Strip Covering**
New England Butt Co., Providence, R. I.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Rubber Tubing and Straining**
New England Butt Co., Providence, R. I.
Royle, John, & Sons, Paterson, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Screw Wire**
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

**MACHINERY—Special**
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, Ohio
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I. (Special Designs)
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Spooling**
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Robinson Mfg. Co., Muncy, Pa.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Spring Making**
National Machinery Exchange (Used), New York, N. Y.
Sleeper & Hartley, Inc., Worcester, Mass.

**MACHINERY—Staple**
Sleeper & Hartley, Inc., Worcester, Mass.

**MACHINERY—Straightening**
Broden Construction Co., Cleveland, Ohio
Lewis Machine Co., The, Cleveland, Ohio
Moslo Machinery, Inc., Cleveland, Ohio
National Machinery Exchange (Used), New York, N. Y.
Nilson, A. H., Machine Co., The, Bridgeport, Conn.
Ruesch, H. J., Machine Co., Newark, N. J.
Shuster, F. B., Co., New Haven, Conn.
Sleeper & Hartley, Inc., Worcester, Mass.

**MACHINERY—Stranding**
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Robinson Mfg. Co., Muncy, Pa.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Strip Steel**
Broden Construction Co., Cleveland, Ohio
Ruesch, H. J., Machine Co., Newark, N. J.

**MACHINERY—Swaging**
National Machinery Exchange (Used), New York, N. Y.
Ruesch, H. J., Machine Co., Newark, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

**MACHINERY—Taping**
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Testing**
Robinson Mfg. Co., Muncy, Pa.
Scott, Henry L., Co., Providence, R. I.

**MACHINERY—Testing Size of Wire**
Davis, R. L., Electric Co., Wallingford, Conn.

**MACHINERY—Testing Spring**
Standard Machinery Co., Providence, R. I.

**MACHINERY—Tinsel Rolling Mills**
American Insulating Mach'y Co., Phila., Pa.
Syncro Machine Co., Rahway, N. J.

**MACHINERY—Trolley Wire**
Vaughn Machinery Co., Cuyahoga Falls, O.

**MACHINERY—Tube Mill**
Ruesch, H. J., Machine Co., Newark, N. J.

**MACHINERY—Welding Wire**
Micro Products Co., Chicago, Ill.
Shuster, F. B., Co., New Haven, Conn.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.

**MACHINERY—Winding**
American Insulating Mach'y Co., Phila., Pa.
Fidelity Machine Co., Philadelphia, Pa.
New England Butt Co., Providence, R. I.
Sleeper & Hartley, Inc., Worcester, Mass.
Syncro Machine Co., Rahway, N. J.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Wire Drawing**
American Insulating Mach'y Co., Phila., Pa.
Broden Construction Co., Cleveland, Ohio
Morgan Construction Co., Worcester, Mass.
National Machinery Exchange (Used), New York, N. Y.
Robinson Mfg. Co., Muncy, Pa.
Ruesch, H. J., Machine Co., Newark, N. J.
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.
Standard Machinery Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.
Waterbury-Farrel Fdry. & Mach. Co., Waterbury, Conn.

**MACHINERY—Wire Measuring**
Durant Mfg. Co., Milwaukee, Wis.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Wire Rope**
New England Butt Co., Providence, R. I.
Thomson-Judd Wire Machinery Co., Sub. of Thomson-Gibb Electric Welding Co., Lynn, Mass.
Watson Machine Co., Paterson, N. J.

**MACHINERY—Wire Tinning**
American Insulating Mach'y Co., Phila., Pa.
New England Butt Co., Providence, R. I.
Syncro Machine Co., Rahway, N. J.

**MACHINERY—Wood Screw**
National Machinery Exchange (Used), New York, N. Y.

**MACHINERY—Wrapping Wire**
Terkelsen Machine Co., Boston, Mass.

**MATERIAL HANDLING EQUIPMENT**
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

**MILLS—Tandem Rolling and Edging**
Standard Machinery Co., Providence, R. I.

# WHERE TO BUY, Continued

**NICKEL SILVER AND PHOSPHOR BRONZE—Rod, Wire and Strip**
Hudson Wire Co., Ossining, N. Y.

**OILS—Wire Drawing**
Standard Industrial Compounds Co., Chicago, Ill.

**OVENS—Industrial**
Carl-Mayer Corp., The, Cleveland, Ohio
Ross, J. O., Engineering Corp., New York, N. Y.

**PANS—Lead and Spelter**
National Annealing Box Co., Washington, Penna.

**PANS—Vulcanizing**
Mossberg Pressed Steel Corp., Attleboro, Mass.

**PAPER—Creped Wrapping**
Crepe-Kraft Co., Newark, N. J.

**PAPER TESTERS—**
Scott, Henry L., Co., Providence, R. I.

**PATENT ATTORNEYS—**
Lancaster, Allwine and Rommel, Washington, D. C.

**PICKLING COMPOUNDS—**
American Chemical Paint Co., Ambler, Pa.

**PICKLING TANK LININGS—**
Keagler Brick Co., Steubenville, Ohio

**PIPING AND FITTINGS—Acid Resistant**
Haveg Corp., Newark, Del.

**PLASTIC TESTERS—**
Scott, Henry L., Co., Providence, R. I.

**POTS—Lead Melting**
Robertson, John, Co., Brooklyn, N. Y.

**PRESSES—Hydraulic and Mechanical**
Robertson, John, Co., Brooklyn, N. Y.
Standard Machinery Co., Providence, R. I. (Mechanical Only)

**PRESSES—Lead**
Robertson, John, Co., Brooklyn, N. Y.

**PRESSURE VESSELS—**
National Annealing Box Co., Washington, Penna.

**PULLERS—Wire**
Scudder, E. J., Fdry. & Mach. Co., Trenton, N. J.
Sleeper & Hartley, Inc., Worcester, Mass.

**PUMPS—Hydraulic**
Robertson, John, Co., Brooklyn, N. Y.

**REEL AND TENSION STAND—**
Fidelity Machine Co., Philadelphia, Pa.
Moslo Machinery, Inc., Cleveland, Ohio
Sleeper & Hartley, Inc., Worcester, Mass.
Robinson Mfg. Co., Muncy, Pa.
Syncro Machine Co., Rahway, N. J.

**REEL CRUTCHES—**
Watson Machine Co., Paterson, N. J.

**REELS—Annealing and Stranding**
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, Ohio
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

**REELS—Steel**
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

**REELS AND SPOOLS—Shipping and Shop**
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

**REELS—Takeoff**
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, Ohio
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

**REELS—Vulcanizing and Impregnating**
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Shuster, F. B., Co., New Haven, Conn.
Stevens Metal Products Co., Niles, O.

**REELS—Wire Drawing**
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Hubbard Spool Co., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, Ohio
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

**REFRACTORIES—High Temperature**
Norton Co., Worcester, Mass.

**ROD BAKERS—**
Carl-Mayer Corp., The, Cleveland, Ohio
Moslo Machinery, Inc., Cleveland, Ohio
Ross, J. O., Engineering Corp., New York, N. Y.

**RODS—Wire—Non-Ferrous**
Hudson Wire Co., Ossining, N. Y.
Platt Bros. & Co., The, Waterbury, Conn.

**RODS—Wire—Steel**
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Keystone Steel & Wire Co., Peoria, Ill.

**ROLL STRAIGHTENERS—**
Moslo Machinery, Inc., Cleveland, Ohio

**RUBBER AND RUBBER COMPRESSION TESTERS—**
Scott, Henry L., Co., Providence, R. I.

**RUST PROOF COMPOUNDS—**
American Chemical Paint Co., Ambler, Pa.
American Lanolin Corp., Lawrence, Mass.

**RUST REMOVING COMPOUNDS—**
American Chemical Paint Co., Ambler, Pa.

**SHEET—Steel**
Continental Steel Corp., Kokomo, Ind.

**SOAPS—Industrial and Wire Drawing**
Miller, R. H., Co., Homer, N. Y.
Standard Industrial Compounds Co., Chicago, Ill.

**SPOOLS—Annealing and Wire Drawing**
Apco Mossberg Co., Attleboro, Mass.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

**SPOOLS—Shipping and Shop**
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

**SPOOLS—Steel**
Apco Mossberg Co., Attleboro, Mass.
Clark, J. L., Mfg. Co., Rockford, Ill.
Hubbard Spool Co., Chicago, Ill.
Mossberg Pressed Steel Corp., Attleboro, Mass.
Stevens Metal Products Co., Niles, O.

**STAMPINGS—Steel**
Hubbard Spool Co., Chicago, Ill
Mossberg Pressed Steel Corp., Attleboro, Mass.

**STRIP—Brass and Non-Ferrous**
Hudson Wire Co., Ossining, N. Y.

**STRIP—Steel**
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.

**STRIP METAL TESTERS—**
Scott, Henry L., Co., Providence, R. I.

**SWIFTS—Take-off**
Apco Mossberg Co., Attleboro, Mass.
Mossberg Pressed Steel Corp., Attleboro, Mass.

**TANK LININGS—Brick**
Keagler Brick Co., Steubenville, Ohio.

**TANKS—Compound**
Watson Machine Co., Paterson, N. J.

**TANKS—Pickling**
Haveg Corp., Newark, Del.

**TANKS—Steel**
Mossberg Pressed Steel Corp., Attleboro, Mass.

**TENSILE TESTERS—**
Scott, Henry L., Co., Providence, R. I.

**TESTING INSTRUMENTS—**
Scott, Henry L., Co., Providence, R. I.

**TRAMRAIL SYSTEMS—**
Cleveland Tramrail Div. of the Cleveland Crane & Engineering Co., Wickliffe, O.

**TREADS—Safety**
Norton Co., Worcester, Mass.

**TRUCKS—**
Morgan Construction Co., Worcester, Mass.
Vaughn Machinery Co., Cuyahoga Falls, O.

**TUBE BENDERS AND FORMERS—**
Ruesch, H. J., Machine Co., Newark, N. J.

**TURKS HEADS—Friction and Power Driven**
Standard Machinery Co., Providence, R. I.

**VALVES AND FITTINGS—Acid Resistant**
Haveg Corp., Newark, Del.

**VULCANIZERS—**
Watson Machine Co., Paterson, N. J.

**VULCANIZING PANS—**
American Insulating Mach'y Co., Phila., Pa.
Mossberg Pressed Steel Corp., Attleboro, Mass.

**WELDERS—Spot and Butt**
Micro Products Co., Chicago, Ill.
Moslo Machinery, Inc., Cleveland, Ohio

**WIRE—Cold Heading**
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Indiana.
Keystone Steel & Wire Co., Peoria, Ill.

**WIRE DRAWING—High Grade Custom**
Hy-Carbo Steel Co., Lowell, Mass.

**WIRE—Electric**
Hudson Wire Co., Ossining, N. Y.

**WIRE—Enameled for Coils**
Winsted Div. of Hudson Wire Co., Winsted, Conn.

**WIRE FINISHES—**
Alrose Chemical Co., Providence, R. I.

**WIRE-MANUFACTURERS—**
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

**WIRE—Nickel Silver and Phosphor Bronze**
Callite Tungsten Corp., Union City, N. J.
Hudson Wire Co., Ossining, N. Y.

**WIRE—Non-Ferrous to Specification for Special Purposes**
Callite Tungsten Corp., Union City, N. J.
Hudson Wire Co., Ossining, N. Y.
Winsted Div. of Hudson Wire Co., Winsted, Conn.

**WIRE—Spring**
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Firth-Sterling Steel Co., McKeesport, Pa.
Keystone Steel & Wire Co., Peoria, Ill.

**WIRE—Stainless Steel**
Callite Tungsten Corp., Union City, N. J.
Firth-Sterling Steel Co., McKeesport, Pa.

**WIRE—Steel—Also Coppered Steel—Also Galvanized Steel**
Bethlehem Steel Co., Bethlehem, Pa.
Continental Steel Corp., Kokomo, Ind.
Keystone Steel & Wire Co., Peoria, Ill.

**WIRE AND STRIP—Zinc**
Platt Bros. & Co., The, Waterbury, Conn.

**WIRE TESTERS—**
Scott, Henry L., Co., Providence, R. I.

**WIRE, WEAVING—Non-Ferrous**
Hudson Wire Co., Ossining, N. Y.

**WRAPPING PAPER—Creped**
Crepe-Kraft Co., Newark, N. J.

**YARN TESTERS—**
Scott, Henry L., Co., Providence, R. I.

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## PRODUCERS OF FINE WIRES IN ALL METALS

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High Brass, Low Brass, Zinc 99.99+ and High Tensile Zinc, Commercial Bronze, Phosphor Bronze, Pure Tin, Lead, Antimonial Lead, Tinsel Lahns, Silver Plated Copper, False Gold and Copper.

Cadmium, Nickel Silver, 10%, 18% and 30%; Silver Plated Copper, False Gold and Special Brass and Bronze Alloys to Specification, Metallic Fibre for Packing Purposes, Copper, Bronze, Zinc, Lead and Aluminum.

### WIRES FOR METAL SPRAYING

Pure Lead, Lead Alloy, Pure Zinc, Zinc Alloy, Copper, Tin, High Brass, Low Brass, Solder Wire, High Conductivity, Electric Wire.

Cadmium, Nickle Silver, (10%, 18%, 30%); Aluminum, Monel Metal, Phosphor Bronze, Pure Nickel, Commercial Bronze.

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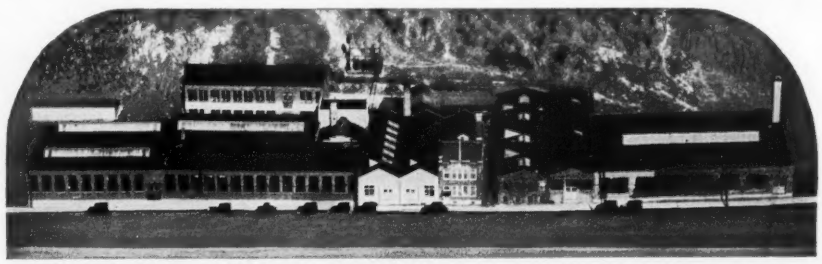
"HUDCO" specially processed Copper Wire for enamelling purposes is drawn from Selected Copper, insuring the maximum conductivity. This is but one example of the use of the most advanced and approved materials and methods in our processing.

BETTER WIRE AT LOWER COST

*Write for Prices and Samples • Let Us Quote on Your Requirements*



"HUDCO" PLANT AT OSSINING, NEW YORK

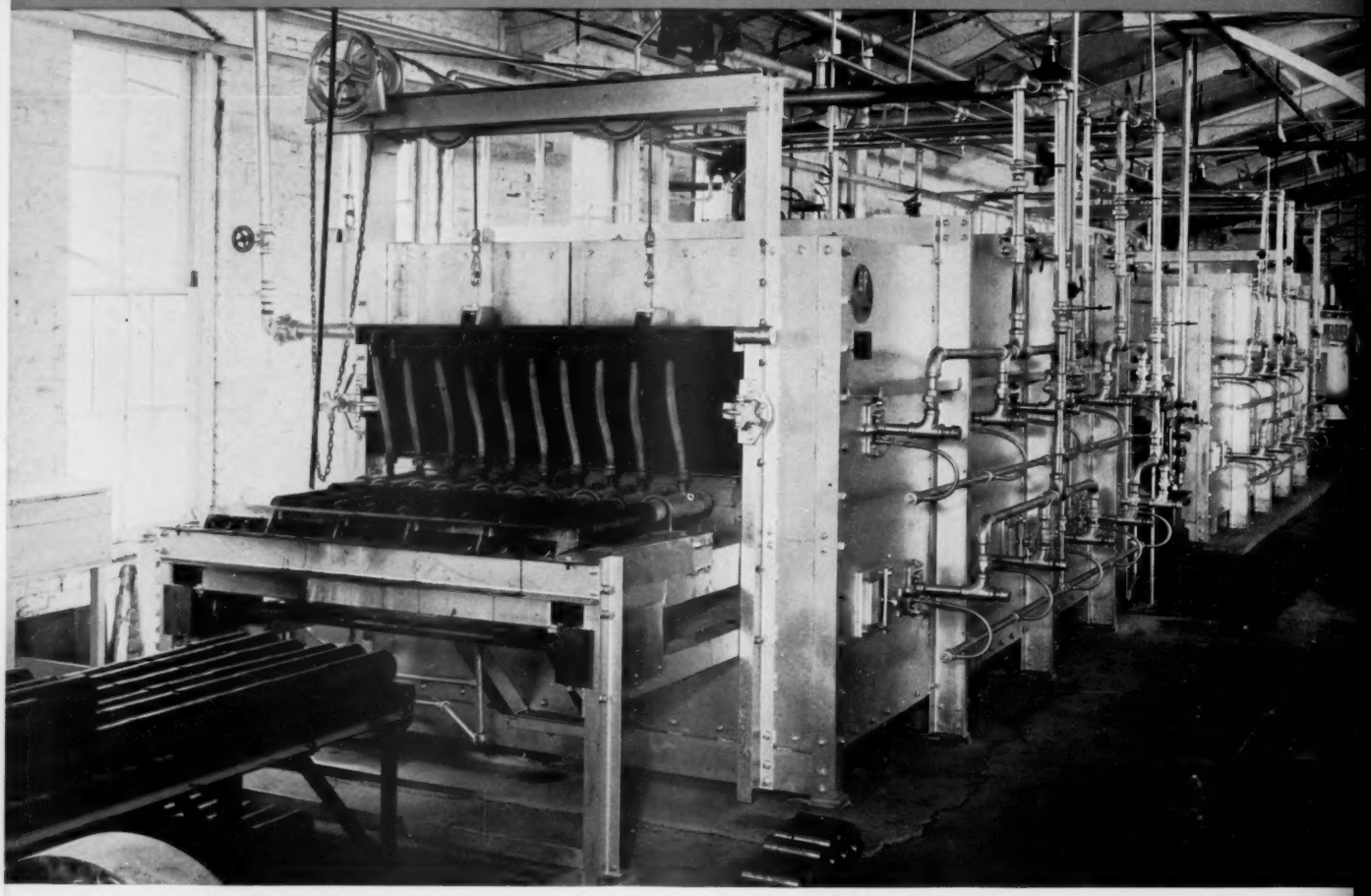
# HUDSON WIRE COMPANY

Established in 1902 — Successors to Royle & Akin

## OSSINING, NEW YORK

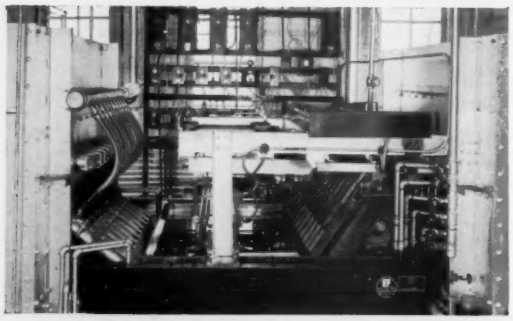
# EF FURNACES

## For Every Industrial Heat Treating Process



## This Completely Automatic EF Gas Fired Equipment

# Heat Treats Shells—Scale-Free



**Continuous automatic quenching equipment. The shells are quenched without coming in contact with air, automatically reversed and charged into the tempering furnace at right.**

**The shell forgings are pushed through the hardening and tempering furnaces in parallel rows, in protective atmosphere-filled conveying tubes. An automatic quenching equipment (shown at left) is located between the furnaces. The shells are quenched without coming in contact with air, automatically reversed and charged into and through the tempering furnace.**

**This installation is gas-fired and is equipped with ten conveying tubes. Several similar larger installations have also just been completed.**

**The above is one of a number of outstanding furnace installations we have made for the production heat treatment of shells and other defense products including machine gun clips, cartridge cases, aircraft and tank parts, tank armor castings, gun and ammunition components, etc.**

**Send for printed matter showing this and other interesting installations. Submit *your* furnace problems to EF Engineers.**

# The Electric Furnace Co., Salem, Ohio

Gas Fired, Oil Fired and Electric Furnaces---For Any Process, Product or Production

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